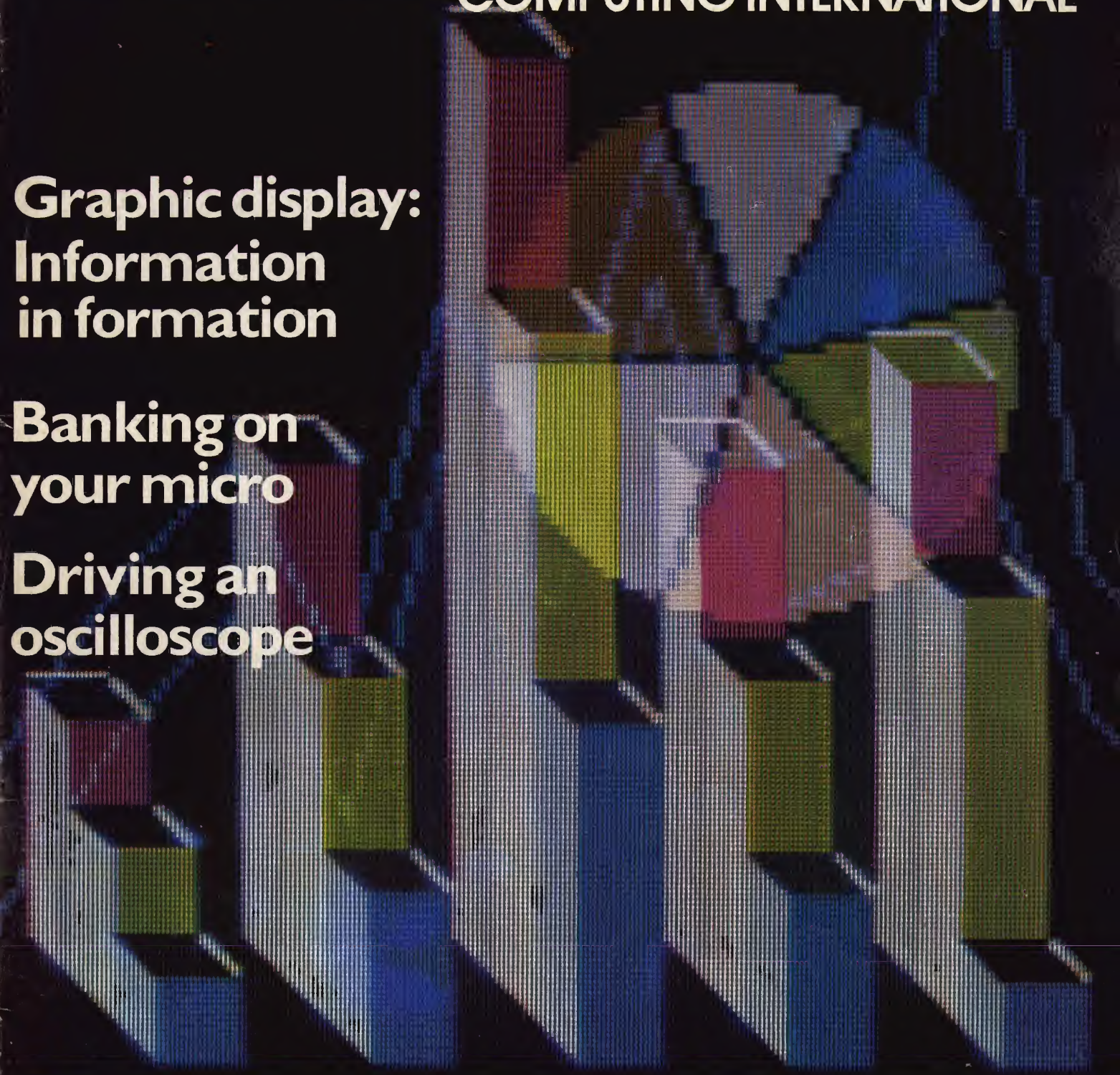
Vol 2 No 6 £1
OCTOBER 1983

COMMODORE

COMPUTING INTERNATIONAL



Graphic display: Information in formation

Banking on your micro

Driving an oscilloscope

The independent magazine for all Commodore computer users

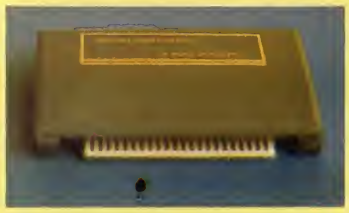
USA $3.50 CANADA $3.50 GERMANY 6DM FRANCE Fr18.5

70151

FROM AUDIO-COMPUTERS (SOLIDISK) THIS MONTH:

NEW LOW PRICES ON VIC-20 HARDWARE ADD-ONS AND THE INTRODUCTION OF NEW SOFTWARE CARTRIDGES

If you have already bought a memory cartridge for your VIC-20 computer, we still have many exciting items to offer, under the heading 'FURTHER EXPANSION'. They are perfectly compatible with all Commodore and many other manufacturers products.



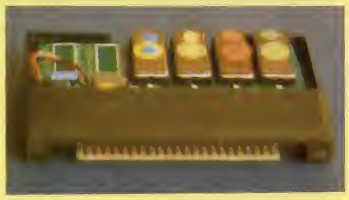
NEW LOW PRICE ON 16K MEMORY CARTRIDGE:

Any program sold for the VIC-20 with 8k or 16k extra memory will run with the SRC16.
The NEW PRICE of the SRC16 is now only £27.00, including VAT and manual.
It is important to know what else you can do with the SRC16 other than running big programs.
1) The SRC16 can be upgraded to 32k bytes of RAM at a fraction of the cost of a 16k cartridge. This upgrade costs only £11.00
2) The SRC16 has an X-ROM SOCKET. Games or utilities ROMs such as SCREEN ROM or SOUND ROM can be bought separately and used in this socket. Each software ROM costs around £5-10.00.
3) The SCR16 can have an EXPANSION SLOT built in. This important fact should be noted, since many VIC users experience fitting problems and extra expense when adding a Programmer's AID toolkit cartridge or the Machine Code Monitor Cartridge to their system. With many other low cost 16k memory cartridges, the user will have to buy a multi slot motherboard just to accommodate any extra cartridges. This feature alone could save you as much as £20! The SLOT is the exact reproduction of the expansion port into which the SRC16 is inserted and will cost you only £3.00. Right now you can choose any of the extra features to be built into your SRC16 cartridge. Simply tick the option boxes shown.

FURTHER EXPANSION TO THE VIC-20 COMPUTER:

1) 3 SLOT MOTHERBOARD:

for those for whom it's too late to buy a SRC16 cartridge or who want more than just memory. The 3 Slot MOTHERBOARD is not without special interest:
a) A Memory Select System allows the user to add the memory capacity of 2 RAM cartridges — for example, an SRC16 and a Commodore VIC-1111 can be used together to provide 32k bytes.
b) An optional 8k Memory System, very flexible, that will give 11775 bytes free or 6655 bytes free in the Low Res area or occasionally 8k bytes at $A000 to $BFFF for developing your own Autostart program can be added. Furthermore, if you then add your SRC16, you will get 28159 bytes free for your VIC 20!
c) 2 EPROM SOCKETS: this feature is very much appreciated by most users and has been added only very recently. You can use either 4k EPROMs (2732) or 8k EPROMs (2764) in these sockets. Each EPROM can be activated individually exactly as if you had 2 extra cartridges in your system!

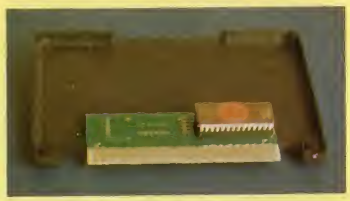


2) THE VIC EPROM PROGRAMMER: (uses 2764 Eproms)

We would need a whole page to describe this exciting peripheral for your VIC-20. Briefly, the cartridge works a little like a Disk. You can insert the VIC EPROM PROGRAMMER (VEP for short) into the SLOT and activate it with:
SYS 39000
On the VEP, you will find 4 EPROM sockets. Now type in 'C' to display the catalog. It will show what is in every EPROM. It could be like this:

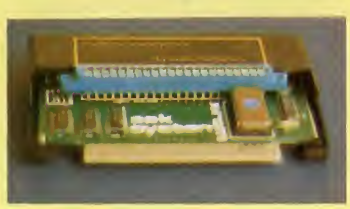
1. BIGBASIC	Simply enter 'R.1' to read the first program. You will instantly see:
2. UTILITY	*READING BIGBASIC
3. AUTOSTART GAME	*READING OK
4. BLANK EPROM	READY

Now you can list it, print it, run it etc. . .
The VEP does the loading of a 16k program in about 3 seconds with no loading error unless you have a bad RAM; it will then list out all the dead or missing bytes!
To put a program into EPROM, load it from tape or disk, activate the VEP and enter 'W PROGRAM-NAME' — very simple to do.
Other useful commands provided by the VEP include Hex Memory Display, Memory Change, Memory Fill, Memory Transfer, Save a Block of Memory, Load Tape, Cold Start, Centronics Printer Drivers etc. . .
You can put Basic, utility or autostart games onto Eprom in a similar way. The VEP will work out where your program is stored and will scan the EPROMs to find enough space to put it.
You can also use it as a self contained Eprom programmer to program, verify and copy Eproms.
Utility and Autostart EPROMs made with the VEP can be used on our Motherboard or on our BLANK SOFTWARE CARTRIDGES and used as any software cartridges.
We supply a small manual together with the VEP showing how you can write an Autostart program, in Basic and in machine code. We will also supply you with a free Blank EPROM and a free Blank Software Cartridge to get you started.
A word of warning: we have developed this equipment to help users in materialising sellable software (we are very keen to buy) and will disclaim any illegal use of it.



SOFTWARE CARTRIDGES

(insert directly into back of VIC, into Motherboard or SRC slot).
1) SCREEN CARTRIDGE: Sets the screen size within limits as small or large as you like. You can for example set the screen to 40 lines × 80 columns and a 'window' of 25 lines × 30 columns, write a letter or draw a colourful playing board and move your window with control keys or joystick. As you are typing in, the window will move along to accommodate. Basic programs can be typed in, listed and run even in 80 column format. Price £10.00.
2) SOUND CARTRIDGE: transforms your VIC into an electric organ. You can play music with the keyboard, add a second voice when it plays the 1st, a 3rd when it plays back the 1st and 2nd etc, define ENVELOPE to create effects like wailing police siren, play music within basic program without slowing the speed of Basic. In short, the sound Rom makes the VIC as tuneful as the BBC micro or the ATARI. Price: £10.00
These 2 cartridges are also available in chip form. You can use the chips in the Motherboard or in the X-ROM socket of your SRC16. Price: £8.00 for either of the 2.
3) MORE CARTRIDGES will be released. We would like to market your programs in cartridge form. Alternatively, we can supply blank cartridges at very competitive prices for commercial use. We are just a phone call away so if you have a good idea, why not give us a ring?



SUMMARY	PRICE/U INCL. VAT
SRC16	£27.00
OPTIONAL EXTRAS FOR THE SRC16:*	
UPGRADE TO 32K	£11.00
EXPANSION SLOT:	£3.00
FURTHER EXPANSION:	
3 SLOT MOTHERBOARD:	£19.95
OPTIONAL EXTRA 8K FOR MOTHERBD*	£16.00
VIC EPROM PROGRAMMER (+ free gift)	£39.00
EXTRA 2764 BLANK EPROM:	£6.00
BLANK SOFTWARE CARTRIDGE:	£3.00
SOFTWARE CARTRIDGES:	
SCREEN CARTRIDGE:	£10.00
SCREEN ROM ONLY:	£8.00
SOUND EFFECT CARTRIDGE:	£10.00
SOUND EFFECT ROM only:	£8.00
Post and packing:	£1.00
TOTAL:	

*I enclose a cheque/postal order payable to SOLIDISK LTD for £:
*Please charge my Access/Barclay credit card account No:
(*Please delete/complete as applicable)

.....

Signature

Name: Mr/Mrs/Miss: .....

Address: .....

.....

.....

Please note: optional extras cannot be purchased alone. Also, if you wish to purchase them at a later date, SRCs and Motherboards must be returned together with the appropriate payment + £1 P+P. We regret we cannot accept orders of less than £10.00. All prices include VAT at 15%. Europe: deduct VAT, add £3.

Official UK dealers:
SUMLOCK, Manchester, Norman DAVIS, Mill Hill, GODFREY'S, Basildon, CURRY'S MICROSYSTEM chain store.

Official European distributors:
Benelux: ECD, Delft Tel 015 134429.
France: RUN informatique sarl, Paris Tel (01) 581 5144.
Germany: VOBIS Data computer GMBH, Aachen Tel (0241) 50 00 81.
SCHAEFER, Roetgen Tel (0240) 88 319.
Italy: SOLIDISK Italia, Inglesias (CA), Tel 0781 22529.
Portugal: LANDREY Engineering, Lisboa Tel 681243.
Sweden and Norway: DIGILOG, Goteborg Tel 031 20 29 00.

Thank you for the interest shown. Marketing Manager: H. PERRY

TO: SOLIDISK TECHNOLOGY LIMITED
(T/A AUDIO COMPUTERS)
87 BOURNEMOUTH PARK ROAD
SOUTHEND ON SEA
ESSEX SS2 5JJ UK

OUR TELEPHONE NUMBER:
CREDIT CARD SALES/
DEALER ENQUIRIES: 0702 618144
ENQUIRIES: 0702 613081

COMMODORE

OCTOBER 1983

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NEWS

Topsy-Turvy World

The Editor would like to point out to readers of the August issue of this magazine that an erroneous reason was given for SWW Computer Systems recent change of name from MMS Computer Systems. The true reason for the change of name was not as we reported an advertising ploy, rather it was a legal necessity. Unknown to the management of SWW, a prior claim to the company name of MMS was in force and as such SWW had to rapidly rethink their operating title. They eventually came up with the ingenious idea of inverting their old and now obsolete title and SWW was created. We at the magazine regret any embarrassment and upset that may have resulted from our report.

Training Courses

Users of CBM microcomputers in business and commerce will be interested to know that the well-established series of intensive two-day short courses offered by the University of Salford has recently been extended to include modules specifically orientated towards the 8000 series of machines.

The beginners course is intended for participants with no previous experience of the CBM range or indeed of microcomputers in general. This course introduces participants to the basic principles of microcomputer systems, program storage and the use of the printer and disk drives.

The second CBM 8000 course is intended for personnel who already possess some knowledge of the machine and of the basic language. This course deals extensively with the use of magnetic disks for data management and with the use of the printer. Word processor, spreadsheet and database packages are available for demonstration and experiment.

Each participant has the sole use of an 8000 series machine during the course and clearly written documentation is provided in advance. The courses are reasonably priced and accommodation is available on campus.

Further information can be obtained from:

Mrs S R Hill
Department of Electronic and Electrical Engineering
University of Salford
Salford M5 4WT
Tel: 061 736 5843 extensions 248/453

Last One

D.J. 'Al' Systems Ltd have announced their new compact version of their highly controversial 'The Last One', a program generator originally launched in 1981.

In keeping with their dynamic image D.J. 'Al' have priced this powerful and flexible package at the amazingly economical sum of £50. Their intentions with this versatile package is to supply the occasional user with the ability to harness the power that may otherwise have been beyond their pockets capability. Even though the original, professional Last One package has been enhanced to include new time saving features, the occasional user may not readily be able to justify the cost – £185 to £330 (+VAT). D.J. 'Al' Systems have a bonus to offer the occasional user. If after purchasing the compact version the user wishes to upgrade his system to the professional version D.J. 'Al' Systems will credit the user in full the price of the compact version.

Area:	*Program Generator*
Company:	*D.J. 'Al' Systems Ltd*
Address:	*Station Road,*
	Ilminster, Somerset
	TA19 9BQ
Tel:	*04605 4117*

Sulis Weds Wiley

John Wiley & Sons have secured an exclusive marketing arrangement with Sullis Software Ltd to distribute their range of micro software for the education market. The packages are available for most of the popular micros but of particular interest to us is the news that the packages will also be available for the CBM 64. Initially the programs will be cassette based but disk based programs will follow rapidly. The first packages were available in August and cover aspects of the English language, including spelling, grammar, pronunciation, sentence construction and vocabulary. Other packages soon to be available will be a variety of subjects which will include History, French and English Literature.

Area:	*Education*
Company:	*Sullis Software*
Distributor:	*John Wiley & Sons*
Address:	*Baffins Lane,*
	Chichester, Sussex
	PO19 1UD
Tel:	*0243 784531*

NEWS

Pegasus Flying High

Pegasus Software Ltd seem to be reaping the reward of long and diligent research with a product that has been proven excellent. The company has clocked up an amazing 10,000 sales of their suite of business programs. To celebrate this milestone Marketing Director Stuart Whittaker presented their 10,000th customer – West Midlands Engineering Employer's Association – with the remaining programs to complete their Pegasus Accounting Suite: a gift valued in the region of £1,000.

And well it seems they are able to afford such largesse. At a recent gathering of dealers it was announced by Mr Colin Stanley – Managing Director of Brikat Developments (Holdings) Ltd, the parent company of Pegasus – that in the first full year of trading Pegasus grossed £650,000, a reported 60% up on their financial forecast. Mr Stanley also predicted a growth to £1.5 millions in the next financial year making an estimated £3 millions in earning for their dealers.

Dealers apparently left the meeting carrying demonstration packs of two new Pegasus packages – Sales Order Processing (incorporated into the existing Invoicing package), and Job Costing, which integrates with the Purchase Ledger and Payroll modules to allocate costs to specific jobs, and allows continuous monitoring of costs and profitability.

Future developments from Pegasus were also outlined, these include a Report Generator module for fast ad-hoc reports from any Pegasus data file: a word processing module for integration with the accounting suite; and a Pegasus Financial Modelling module able to extract from existing data files. And finally, work is also being scheduled on a version of Pegasus accounting to work in a networked environment, to meet the demand now being experienced by a number of Pegasus dealers.

Area:	*Business Suites*	Address:	*20-22 Station Road,*
Company:	*Pegasus Software Ltd*		*Kettering,*
Tel:	*0536 522822*		*Northamptonshire*

Systematic Protection For System Developers

'Dongles' – software protection devices, developed by Wordcraft Systems for use with its own wordprocessing software – are now available for Commodore machines. Each dongle contains a unique coding which is interrogated by the software during program operation. If the dongle is not present or its coding differs from the serial number embedded in the software, the program will not function. Wordcraft Systems guarantees that the devices are unique to each company or product. Costs range from £2.50 for Commodore Vic machines to £15 for IBM-PC versions, with a minimum order quantity set at 100. The range of Commodore machines covered by the dongles are: CBM 4000, 8000, 9000, 700, Vic 20 and CBM 64's.

Area:	*Protection Devices*	Address:	*43 Farley Road, Derby*
Company:	*Wordcraft Systems*		*DE3 6BW*
		Tel:	*0332 683892*

Radio Micro Show

With the coming of Autumn, BBC Radio Wales will launch a new radio show aimed at the home computing market. 'The Micro Show' is planned to be different from those which have gone before, mainly because it is not primarily educational. There will be a beginners section to explain about computers and 'computer talk' but the main aim seems to be that it will operate more as a broadcast computer club: a forum where ideas, information and programs can be exchanged, and new developments analysed and explained.

A feature of the program will be the facility to tape broadcasted computer programs which can then be fed directly into the users own computer and it is claimed that this will be the first time that programs have been transmitted directly on a regular basis by any broadcasting organisation in Britain.

The trial series will commence at 6.30pm on Fridays, beginning in early October and will run for six weeks on Radio Wales' AM frequency of 340 metres, and on VHF Stereo in Wales. Medium wave transmissions can be received successfully over a large part of the British Isles – the software broadcasts will be at a different time, probably on Sundays.

Initially the machines chosen for which software is transmitted will be the BBC and the ZX Spectrum, which have a 12000 band tape interface. However should sufficient requests be received the service will be extended to other machines.

Area:	*Radio Micro*
Name:	*The Micro Show*
Address:	*E2102, BBC,*
	Broadcasting House,
	Llandaff, Cardiff

Commodore Price Cuts

Commodore Business Machines have announced massive cuts on most of their hardware prices.

The percentage of changes range from 17% on a 6400 Daisy Wheel Printer to a massive 47% on their 9000 MF Main Frame CPU. Its original price of £1495.00 changed at the stroke of midnight on 1st September to an amazingly low £795.00. Other price reductions are less startling, but no less amazing for the average cuts are at least 25%.

Mike Tait, Commodore's National Sales Manager for Business Systems said of the changes: "The potential for further increasing our brand leading share of the U.K. small business systems market is greatly strengthened by our ability to pass on the savings in the cost of manufacture to the first time user of micro computers in business. We believe we have always had the most competitively priced hardware and software, proven in many micro computing applications, notably with financial modelling, word processing and information retrieval. Now with the reduced prices, Commodore are even more strongly positioned to further expand their established user base of over 110,000 business installations in the U.K."

COMMODORE PRICE LIST 1 SEPTEMBER 1983
Business Systems Range
Suggested Selling Price
(Excl. VAT)

Item		£	(*)	% Change
4032	32K Computer	495	(695)	–29
8032	SK 32K Computer	675	(995)	–32
8096	SK 96K Computer	795	(1195)	–33
9000	MF Main Frame CPU	795	(1495)	–47
700B	128K Computer W/O Monitor	650	(795)	–18
710B	128K Computer With Monitor	995	No Change	
715B	256K Computer With Monitor	1195	No Change	
2031	Single Disk Drive (170K)	295	(395)	–25
8250	Dual Disk Drive (Double-sided-2 Mgabyte)	895	(1295)	–31
8050	Dual Disk Drive (1 Mgabyte)	895	No Change	
9060	Hard Disk Drive 5 Mgabyte	1995	No Change	
9090	Hard Disk Drive 7.5 Mgabyte	2495	No Change	
4022/4023	Dot Matrix Printer	345	(395)	–12
8023	Dot Matrix Printer	625	(895)	–30
6400	Daisy Wheel Printer	995	(1195)	–17
64K	Upgrade Board	250	(400)	–37
P/IEEE CABLE		30	No Change	
IEEE/IEEECABLE		35	No Change	

(*) (prices to 31st August 1983, excluding VAT)

Elsewhere, it is believed that these cuts have been long overdue. The increased pressure in this ever-expanding business may have had something to do with this *volte-face* on Commodore's usually profit-hungry image. What remains to be seen now is whether any ripples from this move extend to consumer services for with the increased sales that these cuts are likely to produce, one wonders whether their Customer Relations Department will be able to handle the matching upsurge of customer enquiries.

Omigosh!

GOSH – The Guild of Software Houses – ended speculation about their existence when they came forth and dedicated themselves to being the self governing watchbodies of the proliferating software houses. Leading software houses such as Quicksilva, Virgin Games and Bug-Byte founded the guild in response to the public's need for a little more discipline from the Software houses themselves. All GOSH members have pledged to support a Customers' Charter which includes commitment to maintain promised mail-order delivery times, replace defective stock and deal promptly with complaints. There is also a Dealers' Charter and a Code of Conduct for Software Houses, which among other things prohibits poaching of programs and programmers.

It would seem that the birth pangs of the age of computer age (at least where home software is concerned) are settling and making way for the growth of a strong reliable and honourable industry where, hopefully, one day there will be no room for the pirate or fly-by-night operator.

The full text of the Customers' Charter is given below with an address where further information may be garnered.

Mike Johnston
The Secretary
Guild of Software Houses
ZX Microfair
71 Park Lane
London N17 0RG
Tel: 01-801 9172

Guild of Software Houses Customers' Guarantee

1. Members of the Guild guarantee a high technical standard of quality and reliability for their products. Faulty or defective merchandise will be replaced free of charge and despatched promptly.
2. Orders placed with members will be filled with a minimum of delay. Details of members' individual delivery times will be displayed prominently in advertising and strictly adhered to. In no case will deliveries exceed 28 days.
3. Members guarantee to maintain good standards of customer relations and to deal promptly and thoroughly with complaints. Action on complaints will normally be taken within five working days of receipt.
4. Members undertake to avoid advertising products as available before this is in fact the case.
5. Where unforeseen difficulties do occur, which are genuinely outside their control, members of the Guild undertake to keep customers well informed of developments.
6. Members of the Guild guarantee high standards of business integrity in compliance with this Code of Practice. Members' terms and conditions of trade are available on request.
7. These guarantees will be backed up by the Guild of Software Houses and action taken against any member company which fails to meet the required standard. Complaints should be directed in the first instance to the supplier of the goods but if this fails to provide satisfaction, write to the Guild of Software Houses, 71 Park Lane, Tottenham, London N17 0HG (enclosing any relevant correspondence) and the matter will be taken up on your behalf.

Laser Strike

for the commodore 64

**challenge the asteroid field,
maneuver the caves of ice,
experience the thrill,
play laser strike.**

Laser strike, written in full machine language for the Commodore 64.

**Commodore 64 is a registered trademark
of Commodore Business Machines Inc.**

Visa/MC/Check/Money Order accepted

In U.S.
Cassette $24.95
Disk $29.95
Isis Hathor Digital Productions
6184 Verdura Ave.
Goleta, CA 93117
(805) 964-6335
Add $2.00 postage and handling
California residents add 6% sales tax

*** Ask about Laser strike posters**

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Royden, Perkslane
Prestwood, Gt. Missenden
Bucks, England HP16 OJD
02406-3224
You will be billed
for postage and handling

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with accurate control from Suncom

Beating the game requires positive response and fast accurate control.

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A range of 3 quality joysticks all with arcade-style features plus Joy Sensor, the ultimate, with precision touch-sensitive control.
No stick to move, no resistance to movement.

Together with a range of C.E.L. Adaptor leads, they're compatible to a wide range of machines.

Check them out at your dealer – they're sure fire winners.

For details of your nearest stockist contact – Consumer Electronics Limited, Failsworth, Manchester M35 0HS.
Tel: 061-682 2339.

Compatible with
Atari CX2600 Game System*
Atari Personal Computer Systems*
Commodore 64 & Vic 20 Computers*

An adaptor (sold separately) is available for Texas Instruments TI 99/4A Computer*
Adaptor Model No. 11060

*These are the registered Trade Marks of the individual companies concerned

Suncom
from Consumer Electronics.

NEWS

Inmac

With the rapid developments in the field of micros and software giving powerful systems that are truly portable, there is now an increasing need for modems to link these machines together or to larger computers via the telephone from home to office, between offices or anywhere out in the field.

Inmac has announced a new design of modem called dataphone which is designed to fit almost any phone using a unique cup format and which is fully approved by British Telecom.

This acoustic coupler is rated up to 300 baud and can operate in either duplex or half-duplex mode. Signal indicator lights show the status of either ready to use, ready for transmission, received data present or transmit data present. The connection from the Dataphone to computer is via a standard RS 232 Female socket.

The use of state-of-the-art technology enables high performance and reliability to be combined with low cost giving a unit price of £165 each.

Area: *Modem*
Company: *Inmac Ltd*
Tel: *09285 67551*
Address: *Davy Road, Astmoor, Runcorn, Cheshire WA7 1PZ*

Data Logging.

Research organisations and small industrial plants often have applications where high-quality measurement and control are essential to efficiency. To take advantage of this market, Intercole Systems Limited have developed a micro data logging system.

Called the Spectra Micro-ms, it is a scaled down version of the Spectra-ms and can thus handle only 128 analogue inputs. It is built around the 16 bit processor and a command set which enables many tasks to be carried out simply and directly. The data is shown in volts or may be converted into engineering units through user-defined conversion techniques. All comman analogue transducers may be connected to the multiplexers.

Digital output signals may be supplied with relay modules to perform switching and alarm functions. Analogue outputs can be provided for hydraulic and electrical pump, value and temperature controllers.

This is a self-contained unit which is available in a 178 x 337 x 356 mm case or in a form suitable for mounting in a 19" racking. The power can be supplied at 110/220/240V AC from the mains or via 24V DC batteries.

Area: *Data logging*
Company: *Intercole Systems Ltd*
Address: *Avenger Close, Chandlers Ford, Eastleigh, Hants SO5 3YU*
Tel: *04215 4727*

Data Utility

Data Base Computer Systems Limited have released a utility program which links to Pegasus Software Limited's purchase ledger to provide a further level of information reporting.

Pegasus is one of the best known ranges of accounting software for the Commodore 8000 series of computers and many companies are using their purchase ledger program, however the standard package does not allow a line by line analysis of purchase transactions when the key required is the purchase analysis code.

This information is of great value as it enables the user to see exactly the value of each purchase heading, along with a detailed report on whom the suppliers were.

The cost of the utility program is £57.50 (inc VAT) and it is available by post.

Area: *Purchase Ledgers*
Company: *Data Base Computer Systems Limited*
Address: *52 Cranhurst Road, Willesden Green, London NW2 4LP.*
Tel: *01-450 1388*

Clearing the Micro Muddle

Designed by Cound Design Systems Limited and marketed by Abacus Marketing Limited, the Micros Tidy work desk is suitable for the 64 and the VIC 20. It is finished in high quality wood veneer and is designed to hold the micro computer with the tape recorder. The desk will also accommodate the monitor and has compartments for cassettes, cassette deck and manuals.

The piece of furniture measures approximately 79 x 42 x 16.5 cm without legs. On its own, the recommended retail price which includes VAT is £59.95. With the black powder-coated metal legs, the cost is £79.90 again including VAT. When it is not in use, the work table plus the micro and cassette desk slides away and can be locked to make it a secure piece of attractive furniture.

Area: *Furniture*
Company: *Abacus Marketing Limited*
Address: *Abacus House, 60 Barbourne, Worcester WR1 1JA*
Tel: *0905 611161*

Mr. Chip

SOFTWARE

COMMODORE 64 GAMES AND UTILITIES

WESTMINSTER: A game for up to four players, can you lead the party of your choice and win the general election, you tour the 60 constituencies (seats) buying votes, when you can, (just like the real thing!), this must be one of the first board type games specifically written for the computer, why play on your own, have fun with your family and friends playing WESTMINSTER **£5.50**
(available from the 15th Sept)

WH£ELER DEALER: A game for two to twenty players, become a tycoon of the motor trade, you must obtain gearboxes, tyres and engines to produce cars for sale. Form syndicates, buy and exchange parts, buy dealerships, but be careful, you may become bankrupt and have to liquidate, find out what you're made of, have you got what it takes to become a WH£ELER DEALER **£5.50**
(available from 1st Oct)
Also available for the PET, Spectrum, Texas TI 99/4 and Dragon, at **£5.50**

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PONTOON – ROULETTE – ACE'S HIGH More powerful versions, that make three great games of chance for the 64 ..... **£5.50**

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BANK MANAGER 64 – As our Super Bank Manager, but for the 64 ..... **£7.50**
Now available on disk with extra features **£10.00**

Full documentation with all utility programs.

Other software for the VIC and Commodore 64, send for free brochure, including **RABBIT SOFTWARE** at **£5.99.**

VIC 20 GAMES AND UTILITIES

JACKPOT
This is it, the ultimate fruit machine for the VIC with nudge, hold and respin, 100% machine code. "Overall jackpot is a beautifully written simulation giving superb graphics, animation and use of colour. In fact, this programme makes Commodore's fruit machine cartridge look unbelievably cheap and nasty." Home Computing Weekly No 20 19th July 1983.

KWAZY KWAKS:
Accuracy and speed are required for this shooting gallery, superb use of colour and graphics in this new and challenging game from the author of "JACKPOT", 100% machine code program, to the same high standard, joystick or keyboard control. For the unexpanded VIC, (available Now) **£5.50**

PACMANIA: Choose your own game from the following options – difficulty 1-3, speed 1-3, size of maze 1-3, visible or invisible maze, still or moving power pills, define your own key controls, any combination, if this is your type of game, then this is the one for you, for the 3K expanded VIC only, (available Now) **£5.50**

SNAKE BYTE: Guide your ever hungry snake round the screen, eating the flies and wasps, to stay alive you must avoid the deadly mushrooms, quick reactions are required for this biting game, keyboard control, for the unexpanded VIC, (available Now) **£5.50**

BUGSY (Joystick Only) This is a Minefield with a difference! As you step on the stones whilst collecting purple boxes which give you both time and points, they disappear from beneath your feet. DO NOT DESPAIR! "BUGSY" will randomly replace the stones but avoid bumping into him or its sudden death! An original, compulsive and challenging game **£5.50**

MINI-ROULETTE – PONTOON – HI-LOW Three great games of chance for the VIC, try to beat the computer, hours of fun, full colour, sound effects and tunes **£5.50**

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NEWS

Communications Interface

Have you ever thought of turning your 64 into a radio communications terminal but found that you could not do it because you could not find the relevant interface? Well if you have, your troubles are over.

Com-In 64 is a small interface that enables the 64 to accept baudot, morse, asoii and sstv as well as giving you modem, program transmit and word-processing capabilities.

In the sstv mode, the user may receive high resolution pictures in a frame 100 dots horizontal by 120 dots vertical in a four-step grey scale. Message buffers can also be used to respond with text to the other station in this mode.

The screen is split into two with the received text being displayed in the upper half. The lower half acts as a window of the 12Kbyte transmit text buffer. Between the two is the status line which displays the speed, mode, time and current command.

Three cursors are used. First of all there is the usual keyboard cursor which shows where the next character will be entered. The transmit cursor starts in the top left corner and stops when it covers the keyboard cursor. Finally there is the receive cursor which indicates where the next character will be printed.

Along with this there are seven 80 character message buffers which may be loaded or saved from disk or tape, selected on the entry of the program under a specific file name. Here there are three modes available. Display prints the selected buffer in reverse video, write allows the user to store up to 80 characters in the selected buffer and print places the selected buffer in the transmit screen.

Area:	*Interfaces*
Company:	*Computer World*
Address:	*Hilvertsweg 99, 1214 JB Hilversum, Holland*
Tel:	*31 35 12633*

Chattering Children

Currah Computer Components has produced another excellent software package aimed this time at the 4-6 year olds. Chattermaths is an educational speechware package that introduces young minds to simple maths with the added attraction of speech synthesis. The young child can be taught basic number bonds such as 1+1=2, 2+1=3 etc up to 10+10=20, this also applies to the simple subtraction tables such as 2−1=1 etc.

Along with sound, the graphic displays capture the child's attention and makes the whole world of numbers clear and intriguing.

Chattermaths runs on the unexpanded VIC 20 using allophone synthesis to generate the voice. When a response from the child is wrong then the question is asked again with the voice counting aloud the numbers to add etc. When the response from the child is correct then the child is rewarded by the sight of a little man climbing a ladder, the more correct responses the higher he climbs (although the distance climbed is less the more advice the child is given).

The program costs £4.99.

Area:	*Educational Aids*
Company:	*Currah Computer Components Ltd*
Address:	*Graythorp Industrial Estate, Hartlepool, Cleveland*
Tel:	*0429 72996*

ADVENTURES

for

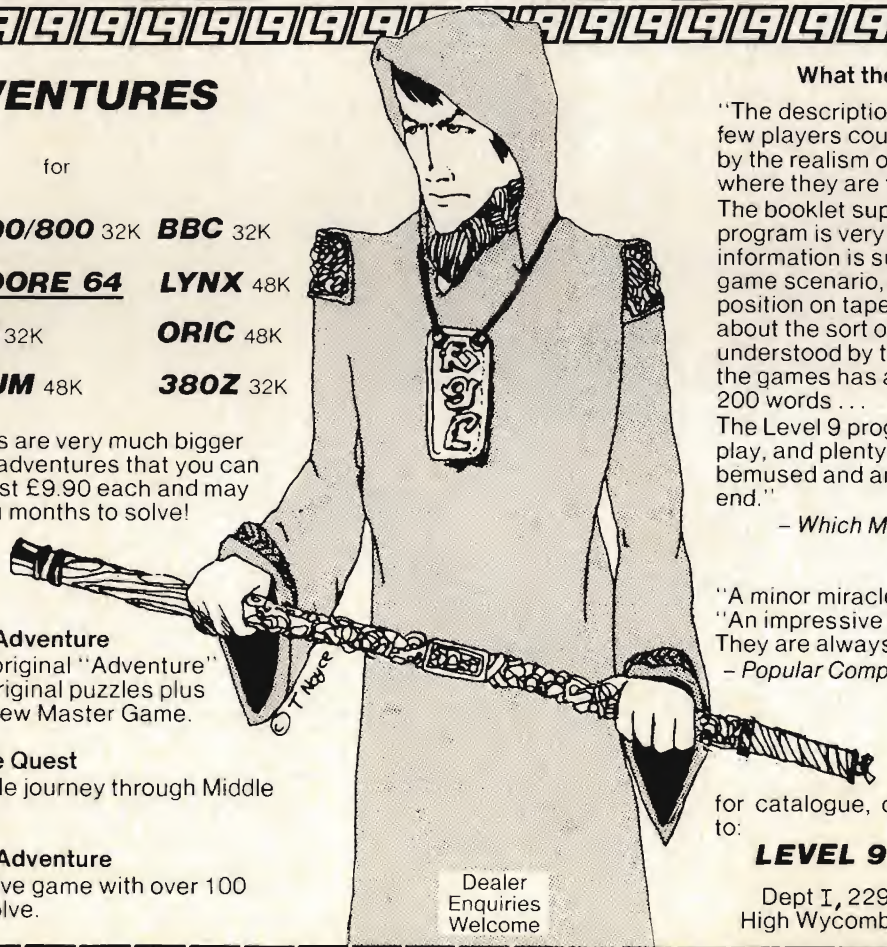
ATARI 400/800 32K **BBC** 32K

COMMODORE 64 **LYNX** 48K

NASCOM 32K **ORIC** 48K

SPECTRUM 48K **380Z** 32K

These games are very much bigger than normal adventures that you can buy. They cost £9.90 each and may well take you months to solve!



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2) Adventure Quest
An epic puzzle journey through Middle Earth.

3) Dungeon Adventure
A truly massive game with over 100 puzzles to solve.

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What the reviewers say

"The descriptions are so good that few players could fail to be ensnared by the realism of the mythical worlds where they are the hero or heroine . . . The booklet supplied with each program is very helpful. Extensive information is supplied about the game scenario, saving your current position on tape and there are hints about the sort of words which are understood by the computer. Each of the games has a vocabulary of about 200 words . . .
The Level 9 programs are great fun to play, and plenty happens to keep you bemused and amused for hours on end."

– Which Micro & Software Review, August

"A minor miracle of programming", "An impressive suite of adventures. They are always a pleasure to play"
– Popular Computing Weekly, 12 May & 23 June

Send order, or SAE for catalogue, describing your micro, to:

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High Wycombe, Bucks HP13 5PG

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Commodore 64.

Commodore VIC 20.

There's a peculiar attitude around at the moment. Everybody's jumped on to the computer bandwagon. They all want to sell you the expensive hardware but they're not so keen when it comes to back-up and programmes.

At Orbit we take a slightly different view. We think you should be able to fully explore the capabilities of a computer before you buy. Which is why we carry a very large catalogue of software for both the Commodore VIC 20 and the Commodore 64. Come into any branch of Orbit and we'll be only too pleased to help you put one through its paces.

Be it a terrifying encounter with the Jelly Monsters, the Voodoo Castle, or just a simple way of sorting out your VAT, we can guarantee you'll come away from your encounter a little shaken and, perhaps, slightly addicted.

So, if you're after a good consistent source of software, or the chance of getting your hands on all things Commodore, there's no better place to come than Orbit.

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NEWS

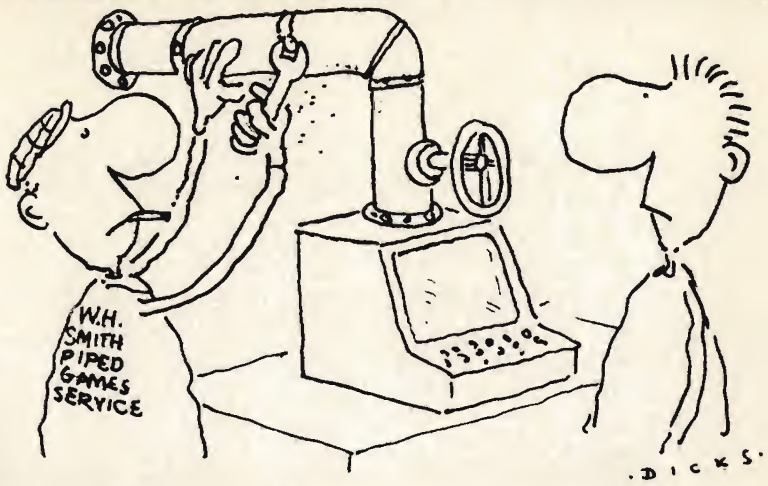
Simulators

Taylor-Wilson Systems have announced that they have secured a contract worth over 100,000 from The Essex Education Authority, to supply the county's engineering departments with five of Taylor-Wilson's machine simulator systems.

The simulators, Toolpath and Millpath, combined with tapeprep – a tape preparation and editing system – greatly simplify the task of teaching CNC machine tool programmers. Because these programs have been created to simulate the action of CNC machine tools, the risk of trainee error causing damage to the machine by wrong programming is eliminated. As a result the programs can be checked for error and edited before being put onto the machine tool.

Currently Toolpath versions are available to suit machine tools with a GE 1050T and a GE 1050HLX controller and Millpath versions are available to suit the Boss 6 and Micon controllers. A version of Millpath simulating the Matchmaker Numericon 850 controller is currently being written as part of the Essex contract.

Area:	*Machine Tool Education*
Company:	*Taylor-Wilson Systems Ltd*
Address:	*Station Road, Dorridge, Solihull B93 8HQ*
Tel:	*05645 6192*



W.H. Smith – Cable T.V.

W.H. Smith have announced a new Cable Services Division within their corporation. Another new acquisition by W.H. Smith is that of Mr Francis Baron who was formerly a chief executive with Guthrie International Ltd. Mr Baron has been appointed managing director of the new division and aims to provide services for cable and satellite T.V.

One of the first services planned will be the introduction, into the home via cable, of video games, by 1984. (Watch out BB). Supplying most of their material will be a Los Angeles-based company called The Games Network Inc.

Needless to say The Games Network have a large and rapidly increasing library of the most popular arcade, home computer and video games. The whole library is designed for all ages to enjoy, there not only being games but nearly a quarter of the programs being described as educational.

With a choice of twenty games a month the users will be able to play to their hearts content, while some games will be deleted and new programs added to keep the interest flowing.

For readers who wish to discover a little more about this exciting project there follows the contact address at W.H. Smith.

Available from:	*Public Relations W.H. Smith, Strand House, 10 New Fetter Lane, London EC4A 1AD*
Tel:	*01-353 0277 extensions 3450/ 3452/3455*

VIC 20 Software Library Hits Back!

According to Darren Bird, the manager of the VIC 20 Users Software Library in Derby, many software houses are using the popular computing press to alienate people against software libraries. Yet they do provide a very valuable service to many people.

With such a variety of software available – a lot of it by mail order only – how can anyone decide for themselves what is a good product and justify how much they have to pay for it? Just because the software is marvellously advertised does not mean that it represents good value for money. Apart from magazine reviews, the only other viable solution is through the software libraries, where people can actually try the product before they decide to buy.

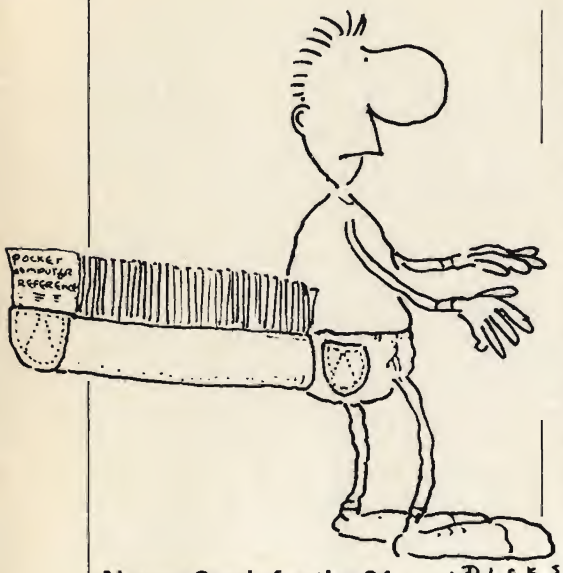
Darren Bird believes that people should be able to purchase software on its own merits rather than on the merits of the advertising. In this respect, small companies producing software which is as good if not better than that of a larger company are at a disadvantage due to the comparative lack of finance. This problem is overcome via the libraries because the software instantly stands out on its own merits and both small and large companies are competing on equal terms. However, to hire out software the libraries need to obtain permission from the manufacturers. Unfortunately, they do not always get that permission.

Why? Because the libraries have no physical control over what is and what is not copied. It might also be worth pointing out that this problem of illegal copying also exists once the software has been bought legally. Protected software can be broken into and this unfortunate situation is helped by the fact that there are firms operating within the law that supply the products that enable the unscrupulous enthusiast to break into the software. Darren Bird believes that such products should not be allowed on the market and that the computer industry should get together to develop a system to prevent home duplication once and for all. This, he claims, would eliminate those companies openly inciting people to infringe copyright and make the library service "much more acceptable to those sceptical software houses."

The VIC 20 Users Software Library estimates that over 90% of the tapes that are hired out are returned on or just after the 14 day hire period which, they claim, means that members are not simply hiring out tapes in order to copy them and that the library is being used for its proper purpose.

Area:	*Software Libraries*
Company:	*VIC 20 Users Software Library*
Address:	*11 Newark Road, Breadsall Estate, Derby DE2 4DJ*
Tel:	*0332 831457*

NEWS



Nanos Cards for the 64

Nanos Systems Corp. have published 3 new 'quick reference' cards for the Commodore machines. The set that will be hailed with gladness is the set for the CBM 64.

The others are for the Vic 20 and the 6502 microprocessor. The 'quick reference' cards are intended as easier to handle and easier to use than the reference manuals and are ideally sized to slip into the back pocket.

The CBM 64 card is 22 sides (pages) long and takes the user through such interesting steps as: Basic commands, derived functions, colour keys and codes, special keyboard keys, hex/dec conversion, sprite pointers, sounds and music, uppercase and lower case and many more. Priced at £3.95 it makes it everything the publishers claim it to be. The Vic 20 and 6502 microprocessor cards are priced £3.95 and £2.95 respectively. All are available by mail order from the address below.

Area:	*Programming Aids*
Company:	*Nanos Systems Corp.*
Sole Agents:	*Elkan Electronics*
Address:	*Freepost, 11 Bury New Road, Prestwich, Manchester M25 6LZ*
Tel:	*061 798 7613*

Dial-a-Quote

Data Efficiency Ltd has launched "Dial-a-Quote" – a new service for computer stationery buyers. By dialling 0442 60155 on the telephone the caller is linked to a fast, free (but for the cost of the call) and friendly service offered by DE's Business Forms Division to advise on all forms of standard and bespoke business forms, including listing paper, continuous labels and envelopes, clean-edge WP stationery and continuous cheques. The service is aimed particularly at those companies who have recently installed a computer or word processing system and who may have little idea of their new stationery requirements.

Further information about this service may be obtained by using the above phone number and asking for one Jackie Clark of DE's Public Relations Dept.

Area:	*Computer Stationery*
Company:	*Data Efficiency Ltd*
Address:	*Maxted Road, Hemel Hempstead, Herts HP2 7LE*
Tel:	*0442 60155*

Dirty Daisies

A compact little package from Inmac (UK) Ltd now available, will make the messy business of cleaning daisy wheels a labour of seconds (assuming of course you have been able to extract the thing speedily from your printer). A nifty little tub reveals its inner secrets to be a special deep pile fabric cleaning pad and a rotating shaft mounted on the inner lid. After dampening the pad with the cleaning fluid, clipping the wheel into place and shutting said lid with a snap the user must then display his dexterity by giving ten full twists of the knob on top.

This done the daisy wheel is lifted out and due to the action of the chemical dampener, sparklingly clean. Gone are the days of running the wheel under a tap while scrubbing at it with a defunct toothbrush. This is an important evolutionary step since harsh mishandling can damage not only the wheel but also cause printer mechanism damage – quite apart from the horror of myopic text instantly sending the boss out to enrich the pockets of the nearest optician.

Area:	*Printers*
Company:	*Inmac (UK) Ltd*
Address:	*Davy Road, Astmoor, Runcorn, Cheshire WA7 1PZ*
Tel:	*09285 67551*

CBM 64/VIC 20 Accounting Suites

A full suite of accounts book keeping programs specifically designed for the Commodore 64 and VIC 20 is now available from Specific Software Ltd.

Along with the rapid growth in usage of home computers, a potentially large market of people with their own businesses have become aware of the possibilities of computerising their accounts. These programs from Specific Software permit a small business to have all the benefits of computerised book keeping and accounts, on what are the smallest practical microcomputers for such a requirement. The system can be bought for less than it now costs a small business to employ a part time book keeper for a year.

Specific Software have put the limited capabilities to great effect in providing for the day to day accounts functions required to run a small business.

The Suite comprises of a Sales Accounts Program with facilities for Daybook, Ledger accounts, Statement printing, Sales Analysis, Aged Debtor Analysis (useful for credit control), Cash Analysis, Address Labels and many other useful functions. An Integrated Invoicing Function is an optional extra, permitting the generation of a sales invoice with full item descriptions, rate computations, VAT and discounting functions.

Altogether an exciting and long awaited addition to the small store of programs available for the CBM 64.

Area:	*Accounts*
Company:	*Specific Software Ltd*
Address:	*10 Farlands Road Stourbridge, West Midlands DY8 2DD*
Tel:	*03843 73377*

AT LAST, THE 132 COLUMN PRINTER FOR THE BUSINESS MICRO COMPUTER USER

The MT180 matrix printer is setting the standard in price/performance for the business micro user. The 160 cps gives you high throughput whilst its standard 132 column width is ideal for the latest accounting and spread sheet software.

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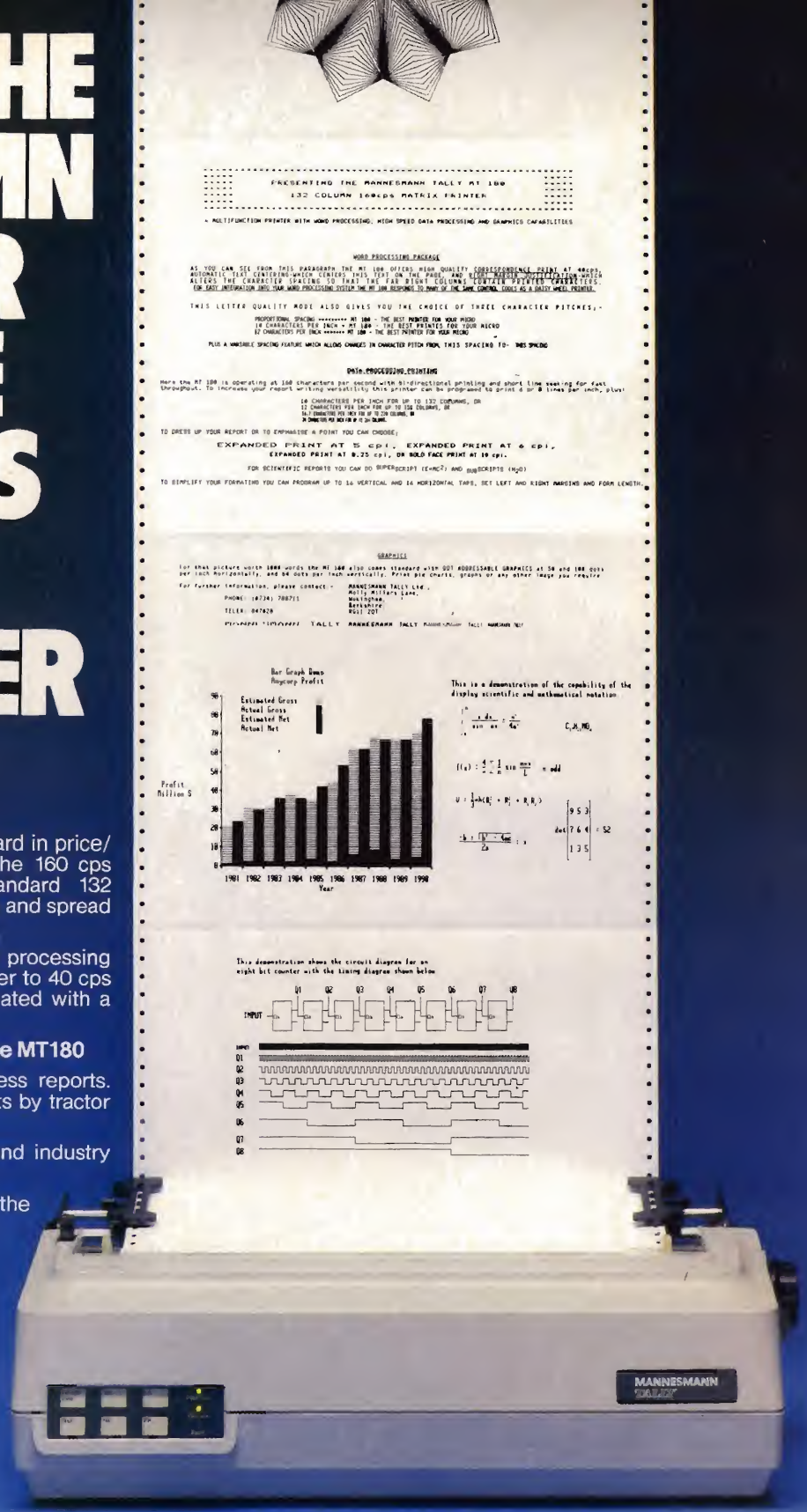

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Note to microcomputer dealers — if you would like to handle these products then ring Geoff Thomas or Terry Bell on the M-T Direct lines — Wokingham (0734) 791619 and 791533.

Graphic display: Information in formation

Graphics are fun. So much so that serious applications are often forgotten. Graphs, for instance, are an important and exciting way of presenting information on the screen. Here we examine the fascinating background to the graphic display of information and take a look at some uses of graphs. Then we show you how.

Talk to someone about graphic formulae and they will probably look at you blankly. Go back a hundred years and try discussing graphs with someone and you will probably get the same response. But swap them round and everyone would understand you because our word 'graph' is an abbreviation of the old phrase 'graphic formula'.

The modern word might be shorter and more convenient but 'graphic formula' is much more descriptive – it literally means drawing a picture of a mathematical formula, rather than using numerals to write it down.

As the following pages show the routines for producing a graph on the screen are relatively simple, but fairly complex information and relationships between sets of information can be represented visually.

Graphs were around a long time before computers, of course, and the idea of representing information visually goes back even further. Thousands of years, in fact.

The squiggles which make up this message you are now reading started off, at the dawn of history, as little pictures scrawled on the walls of caves. And these were the result of the need to represent information visually in order to communicate.

Literal language has evolved into something immensely complex and difficult to comprehend. It's only in the last hundred years or so that the science of linquisitics has grown and one of the questions it seeks to answer is: 'In what way is the written word a graphic display of information?'

With the language of numbers it's much easier, especially if we look at Roman numerals. What could be easier than one stroke to signify the number one, two strokes to signify the number two and so-on? I is one, II is two and III is three. Since IIIII would be getting a bit too much V is used as shorthand for five, X for ten and so-on.

Incidentally, it's interesting to note that in the decimal and binary system using our Arabic numbers the position of the numeral affects its value by a factor of ten or two. In the Roman system position is also important but for a different reason. A numeral's position relative to other numerals gives it a plus value or minus value.

This, of course, is another aspect of the visual representation of information! The more one delves into it the more intriguing it becomes. Consider musical notation, for instance. Could it be described as a rough sort of graph with pitch down the vertical axis and time along the horizontal axis?

Knowing how to display information on the screen using graphics can lead to all sorts of interesting discoveries. Only a genius of an unknown kind could discern a pattern by glancing at columns of figures. But even a child can spot patterns in a 'picture of numbers' or, alternatively, a 'map of numbers'.

By using graphs we can discover relationships between two different and apparently unconnected sets of information. Take lager and oysters. (You may prefer champagne but settle for lager for the time being.)

If you plotted the average monthly sales of lager and the average monthly consumption of oysters on a graph you might well discover a relationship between the two. When oyster consumption is at its lowest, lager sales are at their highest.

The graph cannot, of course, tell us why, but we can use it to test possible theories. We have to be cautious about jumping to conclusions – all oyster eaters go away on holiday when there's no 'r' in the month therefore oyster breeders, worried about their financial future, turn to alcohol and their favourite drink, lager.

If you plot the cumulative totals for both you will get two curves, one upwards (costs), one downwards (value). The point at which they cross tells you when you have spent as much on the car as it is worth.

Introduce another line, the cost of your model of car if bought new (should be gently curving upwards) and the graph becomes even more interesting. It would obviously only happen in unusual circumstances but an ideal time to sell would be when the cost of repair and service during the year, plus the value of the car equals the price of a new car.

An even more interesting and potentially useful application of the graphic display of information is in deciding when to move house. Plot the value of your house over the remaining period of your mortgage and then plot the the amount of mortgage you have left to pay. The difference between the two lines is the 'profit' you would make if you sold the house.

If you plot the profit separately and then plot the amount you are likely to be able to afford as a mortgage, then the sum of these two will be the price you can afford to pay for a house. If you have a dream house in mind you could also plot its ever increasing value. If the line describing profit plus affordable mortgage does not cross the line describing the value of your dream house then you will never be able to afford the house of your dreams.

There are many more uses of graphs and so far we have only scratched the surface. Over the page, for instance, there's a graph which enables you to display seven blocks of information on three levels, or three blocks on seven levels! And pie graphs make displaying proportions easy.

The theory fits the facts but is obviously nonsense. If we plotted other information on the graph – rainfall, sales of woolly jumpers, temperature, ice cream sales – we would eventually come to the conclusion that the relationship between lager and oysters has to do with the increase of temperature in the summer.

Seasonal variations are obviously very important to many businesses, large and small. Failure to identify such seasonal changes could lead to disaster. Take the example of the businessman from Mars who had made his fortune selling Earth bars. He decided to try and break into the Earth ice cream market.

He started trading in January and sales were miserable. They started to pick up in May so he increased production. In June, July and August sales rocketed and so did production. But in September sales plummeted. And just at the time when all the bills were coming in for the extra

materials used in increased production.

Depressed, he went off to Venus where he sculpted the Earth de Milo and had a hit with a song called Earth in Blue Jeans. If only he had looked at graphs of sales for previous years he would have seen that sales always fall off in September and could have adjusted production accordingly.

Although graphs do not enable you to predict exactly what will happen in the future they can help you to make an intelligent estimate about what is likely to happen next. Although graphs have many serious uses they can also be entertaining. Once you have grasped the idea there's nothing to stop you plotting what you like. But it need not necessarily be trivial.

You could, for instance, use graphs to help you decide when you should sell your car. Plot the annual depreciation in value of your car (the motoring organisations advise members on figures) and then estimate the annual cost of repair and servicing. The sum of both figures is the annual cost of running your car before petrol, road tax and so on.

The Routines

Basically, there are three types of displays required when representing information. They are: bar, line, and pie graphs. Following are three simple BASIC routines that will receive information from the user, scale that information to fit on the screen and then display it. The first of these routines is to display groups of data in the form of barcharts. The data is in three groups of seven (or it may be seven groups of three) and is displayed on the screen with a three dimensional effect. The bars are printed on the screen with different colours to make them stand out.

```
10 PRINT"■":DIMHE(2,6):A1$="■■":A2$="■■"
20 GOSUB300
30 POKE53280,0:POKE53281,0:FORR=0TO2:FORP=0TO6
40 IF HE(R,P)=0THEN175
50 S$=MID$(A1$,1+R,1):F$=MID$(A2$,1+R,1):T$="■"
60 PRINT"■■■
```

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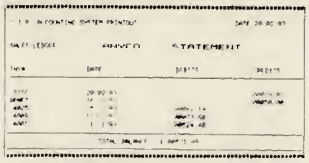
For VIC 20 and CBM 64 Users

SIP ACCOUNTING SYSTEM

Highly comprehensive program designed for 16K, 24K, VIC20 & Printer, 40 col VIC20, CBM 64. Makes an ideal introduction for you and your staff to the world of computer accounts.



Features include:
- Menu driven – simplicity to use!
- Up to 250 accounts per tape
- Day book
- Sales and purchase ledger (or just 1 type)
- Invoice print module available as extra.
- Statements print (for all or just one company)
- Overdue account statements (as above)
- End period carry on to next data tape
- Cash summary – debitors and creditors
- VAT entry (net or gross)
- PLUS many, many more features – all in ONE program.

SIP/AC20 – VIC20 16/24K Tape Based
SIP/DC20 – VIC20 16/24K Disc Based
SIP/AC40 – VIC20 16/24K + 40 column card
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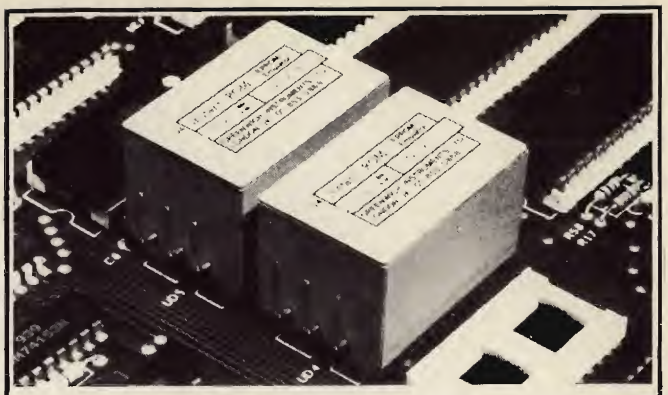

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```
30 PRINTI;:INPUT"VALUE          ";X(I)
40 PRINTI,:INPUT"COLOUR (1-15) ";Y(I)
50 IF X(I)<=0THENPRINT"□";:GOTO30
60 IF Y(I)<1ORY(I)>15THENPRINT"□";:GOTO40
70 NEXTI
80 AT=0:FORJ=1TON:AT=AT+X(J):NEXTJ
90 SYS49152,0,0:TA=0:TX=160:TY=100
100 FORI=1TON:DG=X(I)*360/AT
110 GOSUB200:NEXTI
120 GETA$:IFA$<>"←"THEN120
130 SYS49845:END
200 JJ=40*π*2/360:K=1
210 TA=TA+DG/2:TD=10+N:GOSUB300
220 TA=TA-DG/2:TD=40:GOSUB400:TA=TA+90
230 FORMM=1TODG:TD=JJ:GOSUB400:TA=TA+K:NEXTMM
240 TA=TA+90:TD=41:GOSUB400:TA=TA-DG/2
250 TA=TA+180:TD=10:GOSUB300:SYS50713,TX,TY,Y(I),1,1
255 TD=55:GOSUB300
260 TA=TA+180:TD=65+10+N:GOSUB300:TA=TA+DG/2+180:RETURN
300 TX=TX+TD*SIN(TA*π/180):TY=TY+TD*COS(TA*π/180):RETURN
400 ZX=TX:ZY=TY:GOSUB300:SYS49874,ZX,ZY,TX,TY,Y(I),1:RETURN
READY.
```

The last program just displays the data as a line on the screen. The number of data items are entered followed by the actual data values. The values are scaled down to the required x and y coordinates and then plotted as lines between the points.

```
10 GOSUB1000
15 SYS49152,0,0
16 DX=300/(N-1):X1=10
17 SYS49874,10,190,310,190,1,1
18 GOSUB100
20 FORI=2TON
30 X2=X1+DX
35 SYS49874,X2,Y(I)+10,X1,Y(I-1)+10,1,1
36 SYS49585,X2,191,1,1:SYS49585,X2,192,1,1
37 X1=X2
40 NEXTI
50 GETA$:IFA$<>"←"THEN50
60 SYS49845:END
100 SYS49874,10,10,10,190,1,1
110 S1=10↑(INT(LOG(MAX)/LOG(10))-1)
115 IFMAX>2ANDS1<1THENS1=1
120 FORI=190TO10STEP-8C*S1
130 SYS49585,9,I,1,1:SYS49585,8,I,1,1
140 NEXTI:RETURN
1000 INPUT"□";"HOW MANY POINTS ";N
1010 DIMY(N):FORI=1TON
1020 PRINTI;:INPUT"VALUE  ";Y(I)
1030 IF Y(I)<0THENPRINT"□";:GOTO1020
1040 NEXT I
1050 MAX=0:FORI=1TON:IFY(I)>MAXTHENMAX=Y(I)
1060 NEXT I
1070 IFMAX=0THENRUN
1080 SC=180/MAX
1090 FORI=1TON:Y(I)=180-INT(Y(I)*SC):NEXTI
1100 RETURN
READY.
```

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GRAPHIC DISPLAY

The hi-res routines

When entered, these routines will allow the setting up of the hi-res screen, the plotting of points, lines, and a fill routine (which only works in standard hi-res).

```
10 I=49152: T=0:PRINT"2"
20 READ A
30 IF=-1T=EN200
40 IFA<>255THEN50
50 POKEI,A
60 T=T+A:I=I+1
70 GOTO20
100 READ A$
110 PRINTT,A,A$
120 IF T=ATHENPPINT"?"  T=0: GOTO20
130 ER=1: T=0:GOTO20
200 IF ER=0THEN PRINT"NNO ERRORS":END
1000 REM ******************************
1010 REM * THESE ROUTINES ALLOW THE   *
1020 REM *PRODUCTION OF HIRES GRAPHICS*
1030 REM *DISPLAYS ON THE 64. ALL OF  *
1040 REM *THE ROUTINES HAVE THE       *
1050 REM *FACILITY FOR MULTI-COLOUR OR*
1060 REM *STANDARD HI-RES EXCEPT FOR  *
1070 REM *THE FILL ROUTINE WHICH ONLY *
1080 REM *ALLOWS THE FILLING OF STAND-*
1090 REM *ARD HIRES AREAS.            *
1100 REM ******************************
1110 REM * EACH ROUTINE IS CALLED WITH*
1120 REM *A SYS CALL FOLLOWED BY THE  *
1130 REM *PARAMETERS SEPARATED BY ','.*
1140 REM ******************************
1150 REM *SYS(49152),MODE,COLOUR      *
1160 REM *    SELECT AND SET UP HI-RES *
1170 REM *    MODE. MODE=0 FOR STANDARD*
1180 REM *    AND 1 FOR MULTI-COLOUR.  *
1190 REM *    COLOUR IS FOR THE BORDER *
1200 REM *    AND THE SCREEN.          *
1210 REM ******************************
1220 REM *SYS(49182)                  *
1230 REM *    GO FROM NORMAL SCREEN TO *
1240 REM *    HIRES SCREEN.            *
1250 REM ******************************
1260 REM *SYS(49241)                  *
1270 REM *    CLEARS THE HIRES SCREEN. *
1280 REM ******************************
1290 REM *SYS(49845)                  *
1300 REM *    GO FROM HIRES SCREEN TO  *
1310 REM *    NORMAL SCREEN            *
1320 REM ******************************
1330 REM *SYS(49585),X,Y,COL,BR       *
1340 REM *    PLOTS A POINT AT X,Y IN  *
1350 REM *    COLOUR COL USING BRUSH BR*
1360 REM ******************************
1370 REM *SYS(49874),X1,Y1,X2,Y2,CL,BR*
1380 REM *    PLOTS A LINE BETWEEN     *
1390 REM *    X1,Y1 AND X2,Y2 WITH     *
1400 REM *    COLOUR CL AND BRUSH BR.  *
1410 REM ******************************
1420 REM *SYS(50713),X,Y,COL,BR1,BR2  *
1430 REM *    FILLS AN ENCLOSED AREA.  *
1440 REM *    POINT X,Y IS WITHIN THE  *
1450 REM *    AREA AND BR1 AND BR2 MUST*
1460 REM *    BOTH BE 1.               *
1470 REM ******************************
1480 REM *USR(BRUSH),X,Y              *
1490 REM *    RETURNS A 1 IF THE POINT *
1500 REM *    IS SET USING THAT BRUSH  *
1510 REM *    OR A 0 IF IT IS NOT.     *
1520 REM ******************************
20000 DATA32,253,174,32,235,183,138
20010 DATA141,32,208,141,33,208,165
20020 DATA20,133,251,240,2,162,0
20030 DATA32,89,192,32,128,192,32
20040 DATA166,192,169,59,141,17,208
20050 DATA169,29,141,24,208,165,251
20060 DATA240,5,169,216,141,22,208
20070 DATA169,128,133,56,133,52,173
20080 DATA2,221,9,3,141,2,221
20090 DATA173,0,221,41,252,9,1
20095 DATA 8560,"LINES 20000-20090"
20100 DATA141,0,221,169,132,141,136
20110 DATA2,169,79,141,17,3,169
20120 DATA197,141,18,3,96,160,0
20130 DATA169,64,133,87,169,191,133
20140 DATA88,169,0,145,87,165,87
20150 DATA240,5,198,87,76,99,192
20160 DATA198,88,165,88,201,159,240
20170 DATA7,169,255,133,87,76,99
20180 DATA192,96,160,0,169,231,133
20190 DATA87,169,135,133,88,138,145
20195 DATA 8560,"LINES 20100-20190"
20200 DATA87,165,87,240,5,198,87
20210 DATA76,138,192,198,88,165,88
20220 DATA201,131,240,7,169,255,133
20230 DATA87,76,138,192,96,160,0
20240 DATA169,231,133,87,169,219,133
20250 DATA88,162,0,145,87,165,87
20260 DATA240,5,198,87,76,176,192
20270 DATA198,88,165,88,201,215,240
20280 DATA7,169,255,133,87,76,176
20290 DATA192,96,165,90,201,0,240
20295 DATA 9637,"LINES 20200-20290"
20300 DATA16,201,1,208,6,165,87
20310 DATA201,64,144,6,32,181,194
20320 DATA76,72,178,165,91,201,200
20330 DATA144,6,32,181,194,76,72
20340 DATA178,165,89,41,7,133,94
20350 DATA169,7,56,229,94,133,94
20360 DATA165,251,240,11,70,94,6
20370 DATA94,165,94,24,105,1,133
20380 DATA95,165,94,240,9,168,169
20390 DATA1,10,136,208,252,240,2
20395 DATA 7927,"LINES 20300-20390"
20400 DATA169,1,133,94,165,95,240
20410 DATA9,168,169,1,10,136,208
20420 DATA252,240,2,169,1,133,95
20430 DATA169,0,133,92,133,88,133
20440 DATA87,165,91,41,7,133,93
20450 DATA165,91,74,74,74,133,91
20460 DATA160,5,24,10,38,88,136
20470 DATA208,249,133,87,165,91,160
20480 DATA3,24,10,136,208,251,133
20490 DATA91,24,101,87,133,91,165
20495 DATA 7568,"LINES 20400-20490"
20500 DATA88,105,0,133,92,160,3
20510 DATA24,70,90,102,89,136,208
20520 DATA248,165,89,133,87,165,90
20530 DATA133,88,160,3,24,6,87
20540 DATA38,88,136,208,248,160,8
20550 DATA24,165,91,101,87,133,87
20560 DATA165,92,101,88,133,88,136
20570 DATA208,240,24,165,93,101,87
20580 DATA133,87,169,0,101,88,24
20590 DATA169,160,101,88,133,88,24
20595 DATA 7438,"LINES 20500-20590"
20600 DATA165,89,101,91,133,91,169
20610 DATA0,101,92,133,92,96,32
20620 DATA253,174,32,235,183,165,20
20630 DATA133,89,165,21,133,90,138
20640 DATA133,91,32,253,174,32,235
20650 DATA183,138,133,252,165,20,133
20660 DATA253,32,205,192,169,54,133
20670 DATA1,165,251,208,3,76,123
20680 DATA194,165,252,201,0,240,17
20690 DATA201,1,240,40,201,2,240
20695 DATA 9049,"LINES 20600-20690"
20700 DATA81,201,3,240,114,169,55
20710 DATA133,1,96,160,0,165,94
20720 DATA73,255,133,94,165,95,73
20730 DATA255,133,95,177,87,37,94
20740 DATA37,95,145,87,169,55,133
20750 DATA1,96,160,0,165,95,73
20760 DATA255,133,95,177,87,5,94
20770 DATA37,95,145,87,169,132,24
20780 DATA101,92,133,92,6,253,6
20790 DATA253,6,253,6,253,177,91
20795 DATA 7846,"LINES 20700-20790"
20800 DATA41,15,24,101,253,145,91
20810 DATA169,55,133,1,96,160,0
20820 DATA165,94,73,255,133,94,177
20830 DATA87,37,94,5,95,145,87
20840 DATA24,169,132,101,92,133,92
20850 DATA177,91,41,240,24,101,253
20860 DATA145,91,169,55,133,1,96
20870 DATA160,0,177,87,5,94,5
20880 DATA95,145,87,169,216,24,101
20890 DATA92,133,92,165,253,145,91
20895 DATA 7521,"LINES 20800-20890"
20900 DATA169,55,133,1,96,160,0
20910 DATA165,252,240,35,177,87,5
20920 DATA94,145,87,169,132,24,101
20930 DATA92,133,92,165,253,10,10
20940 DATA10,10,133,95,177,91,41
20950 DATA15,24,101,95,145,91,169
20960 DATA55,133,1,96,165,94,73
20970 DATA255,133,94,177,87,37,94
20980 DATA145,87,169,55,133,1,96
20990 DATA169,4,141,136,2,173,2
20995 DATA 7086,"LINES 20900-20990"
21000 DATA221,41,252,141,2,221,169
21010 DATA27,141,17,208,169,200,141
21020 DATA22,208,169,21,141,24,208
21030 DATA96,32,253,174,32,235,183
21040 DATA138,141,62,3,169,0,141
21050 DATA63,3,165,20,141,60,3
21060 DATA165,21,141,61,3,32,253
21070 DATA174,32,235,183,138,141,66
21080 DATA3,169,0,141,67,3,165
21090 DATA20,141,64,3,165,21,141
21095 DATA 7605,"LINES 21000-21090"
21100 DATA65,3,32,253,174,32,235
21110 DATA183,138,133,252,165,20,133
21120 DATA254,173,64,3,56,237,60
21130 DATA3,141,68,3,173,65,3
21140 DATA237,61,3,141,69,3,173
21150 DATA66,3,56,237,62,3,141
21160 DATA70,3,173,63,3,237,67
21170 DATA3,141,71,3,169,1,141
21180 DATA94,2,141,96,3,169,0
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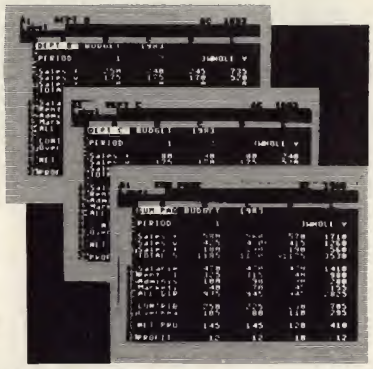

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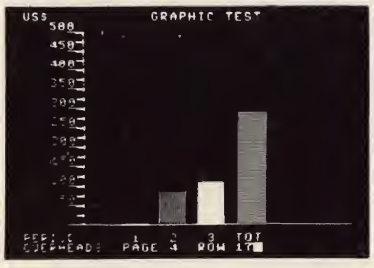

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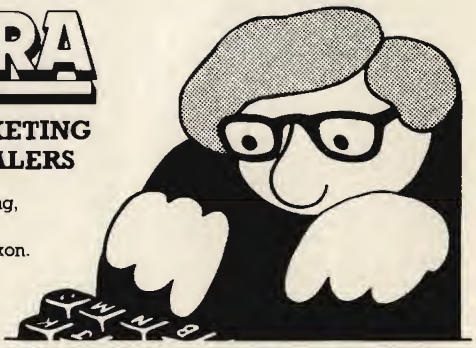

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GRAPHIC DISPLAY

```
21190 DATA141,95,3,141,97,3,173
21195 DATA 6680,"LINES 21100-21190"
21200 DATA71,3,41,128,240,8,169
21210 DATA255,141,94,3,141,95,3
21220 DATA173,69,3,41,128,240,8
21230 DATA169,255,141,96,3,141,97
21240 DATA3,173,69,3,41,128,240
21250 DATA30,173,69,3,73,255,141
21260 DATA73,3,24,173,68,3,73
21270 DATA255,105,1,141,72,3,173
21280 DATA73,3,105,0,141,73,3
21290 DATA76,150,195,173,68,3,141
21295 DATA 6728,"LINES 21200-21290"
21300 DATA72,3,173,69,3,141,73
21310 DATA3,173,71,3,41,128,240
21320 DATA30,173,71,3,73,255,141
21330 DATA75,3,24,173,70,3,73
21340 DATA255,105,1,141,74,3,173
21350 DATA75,3,105,0,141,75,3
21360 DATA76,199,195,173,70,3,141
21370 DATA74,3,173,71,3,141,75
21380 DATA3,173,72,3,56,237,74
21390 DATA3,141,88,3,173,73,3
21395 DATA 6013,"LINES 21300-21390"
21400 DATA237,75,3,141,89,3,41
21410 DATA128,240,60,169,255,141,90
21420 DATA3,141,91,3,169,0,141
21430 DATA92,3,141,93,3,173,74
21440 DATA3,141,76,3,173,75,3
21450 DATA141,77,3,173,72,3,141
21460 DATA78,3,173,73,3,141,79
21470 DATA3,173,71,3,41,128,208
21480 DATA70,169,1,141,90,3,169
21490 DATA0,141,91,3,76,83,196
21495 DATA 6293,"LINES 21400-21490"
21500 DATA169,0,141,90,3,141,91
21510 DATA3,169,255,141,92,3,141
21520 DATA93,3,173,72,3,141,76
21530 DATA3,173,73,3,141,77,3
21540 DATA173,74,3,141,78,3,173
21550 DATA75,3,141,79,3,173,69
21560 DATA3,41,128,208,10,169,1
21570 DATA141,92,3,169,0,141,93
21580 DATA3,173,76,3,141,82,3
21590 DATA173,77,3,141,83,3,173
21595 DATA 5994,"LINES 21500-21590"
21600 DATA78,3,141,80,3,173,79
21610 DATA3,141,81,3,173,76,3
21620 DATA56,237,78,3,141,84,3
21630 DATA173,77,3,237,79,3,141
21640 DATA85,3,78,77,3,110,76
21650 DATA3,173,78,3,56,237,76
21660 DATA3,141,86,3,173,79,3
21670 DATA237,77,3,141,87,3,173
21680 DATA60,3,133,89,173,61,3
21690 DATA133,90,173,62,3,133,91
21695 DATA 5826,"LINES 21600-21690"
21700 DATA165,254,133,253,32,207,193
21710 DATA173,87,3,41,128,240,60
21720 DATA173,86,3,24,109,80,3
21730 DATA141,86,3,173,87,3,109
21740 DATA81,3,141,87,3,173,60
21750 DATA3,24,109,92,3,141,60
21760 DATA3,173,61,3,109,93,3
21770 DATA141,61,3,173,62,3,24
21780 DATA109,90,3,141,62,3,173
21790 DATA63,3,109,91,3,141,63
21795 DATA 5995,"LINES 21700-21790"
21800 DATA3,76,41,197,173,86,3
21810 DATA56,237,84,3,141,86,3
21820 DATA173,87,3,237,85,3,141
21830 DATA87,3,173,60,3,24,109
21840 DATA96,3,141,60,3,173,61
21850 DATA3,109,97,3,141,61,3
21860 DATA173,62,3,24,109,94,3
21870 DATA141,62,3,173,63,3,109
21880 DATA95,3,141,63,3,173,82
21890 DATA3,56,233,1,141,82,3
21895 DATA 5432,"LINES 21800-21890"
21900 DATA173,83,3,233,0,141,83
21910 DATA3,173,83,3,240,7,201
21920 DATA255,240,11,76,151,196,173
21930 DATA82,3,240,3,76,151,196
21940 DATA96,165,102,208,46,165,101
21950 DATA208,42,165,100,208,38,165
21960 DATA99,208,34,165,98,201,128
21970 DATA240,16,201,192,208,24,165
21980 DATA97,201,130,208,13,169,3
21990 DATA133,252,208,30,165,97,240
21995 DATA 9018,"LINES 21900-21990"
22000 DATA8,201,129,240,10,201,130
22010 DATA240,12,32,181,194,76,72
22020 DATA178,169,1,133,252,208,6
22030 DATA169,2,133,252,208,0,32
22040 DATA253,174,32,235,183,134,91
22050 DATA169,0,133,92,165,20,133
22060 DATA89,165,21,133,90,32,205
22070 DATA192,165,251,240,7,165,95
22080 DATA24,101,94,133,94,169,54
22090 DATA133,1,160,0,177,87,37
22095 DATA 8397,"LINES 22000-22090"
22100 DATA94,240,45,165,251,240,27
22110 DATA165,94,56,229,95,133,94
22120 DATA177,87,37,95,240,14,177
22130 DATA87,37,94,240,16,165,252
22140 DATA201,3,240,27,208,14,165
22150 DATA252,201,1,240,19,208,6
22160 DATA165,252,201,2,240,11,169
22170 DATA0,141,114,3,133,97,133
22180 DATA98,240,13,169,1,141,114
22190 DATA3,169,129,133,97,169,128
22195 DATA 8696,"LINES 22100-22190"
22200 DATA133,98,169,0,170,168,133
22210 DATA99,133,100,133,101,133,102
22220 DATA169,55,133,1,169,0,96
22230 DATA32,253,174,32,235,183,142
22240 DATA62,3,162,0,32,241,183
22250 DATA134,254,162,0,32,241,183
22260 DATA142,115,3,162,0,32,241
22270 DATA183,141,116,3,169,0,141
22280 DATA63,3,165,20,141,60,3
22290 DATA165,21,141,61,3,169,3
22295 DATA 7501,"LINES 22200-22290"
22300 DATA205,115,3,48,8,205,116
22310 DATA3,48,3,76,93,198,32
22320 DATA181,194,76,72,178,32,70
22330 DATA199,32,205,192,169,0,133
22340 DATA2,165,251,208,14,169,1
22350 DATA141,115,3,141,116,3,141
22360 DATA106,3,76,126,198,169,2
22370 DATA141,106,3,169,0,141,118
22380 DATA3,141,117,3,32,189,199
22390 DATA32,70,199,173,115,3,133
22395 DATA 7123,"LINES 22300-22390"
22400 DATA252,32,167,197,173,114,3
22410 DATA240,3,76,90,199,32,70
22420 DATA199,173,116,3,133,252,32
22430 DATA167,197,173,114,3,240,3
22440 DATA76,90,199,173,62,3,201
22450 DATA199,240,42,32,70,199,173
22460 DATA115,3,133,252,230,91,32
22470 DATA167,197,173,114,3,208,24
22480 DATA32,70,199,173,116,3,133
22490 DATA252,230,91,32,167,197,173
22495 DATA 8822,"LINES 22400-22490"
22500 DATA114,3,208,6,32,121,199
22510 DATA76,229,198,169,0,141,118
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22530 DATA42,32,70,199,173,115,3
22540 DATA133,252,198,91,32,167,197
22550 DATA173,114,3,208,24,32,70
22560 DATA199,173,116,3,133,252,198
22570 DATA91,32,167,197,173,114,3
22580 DATA208,6,32,140,199,76,27
22590 DATA199,169,0,141,117,3,32
22595 DATA 7824,"LINES 22500-22590"
22600 DATA70,199,173,115,3,133,252
22610 DATA165,254,133,253,32,207,193
22620 DATA56,173,60,3,237,106,3
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22640 DATA0,141,61,3,201,2,144
22650 DATA3,76,90,199,76,137,198
22660 DATA173,60,3,133,89,173,61
22670 DATA3,133,90,173,62,3,133
22680 DATA91,169,0,133,92,96,166
22690 DATA2,240,26,202,189,0,207
22695 DATA 7727,"LINES 22600-22690"
22700 DATA141,62,3,202,189,0,207
22710 DATA141,61,3,202,189,0,207
22720 DATA141,60,3,134,2,76,126
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22760 DATA173,117,3,240,1,96,169
22770 DATA1,141,117,3,32,70,199
22780 DATA198,91,166,2,224,187,144
22790 DATA6,32,181,194,76,126,185
22795 DATA 7733,"LINES 22700-22790"
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22850 DATA3,105,0,141,65,3,133
22860 DATA90,173,62,3,133,91,169
22870 DATA0,133,92,173,65,3,240
22880 DATA13,201,1,240,1,96,173
22890 DATA64,3,201,64,144,1,96
22895 DATA 7102,"LINES 22800-22890"
22900 DATA173,116,3,133,252,32,167
22910 DATA197,173,114,3,240,1,96
22920 DATA173,64,3,141,60,3,173
22930 DATA65,3,141,61,3,76,189
22940 DATA199
22995 DATA 3054,"LINES 22900-22990",-1
READY.
```

SOFTWARE REVIEW

Bumper Package

This month we shall be looking at the offerings of two companies – Interceptor Software Ltd and The Computer Room's software division – Bubble Bus. On inspection it was apparent that both are going into the CBM 64 and Vic 20 games market in a big way.

The bumper package of games caused many an eye to glint and a lot of itchy fingers reached for the few joysticks around. The office ground to a halt as staff lined up to play 'Exterminator', a kill everything on the screen game from Bubble Bus. Others at the end of the queue pounced on the Vic 20 games from Interceptor. Shortly curious moans and groans amid exultations were heard issuing from hunched figures while the Boss muttered darkly in the background.

Exterminator

This game requires the player to shoot down everything but the tarrantula. The tarrantula is a regular hazard that creeps across the bottom of the screen, creating – in certain situations an inconvenient nuisance factor. On beginning play the screen fills with cacti through which a black headed, red worm wends its way. The player controls a little red firing mechanism with which he uses to shoot down the worm. Unwary targetting causes the worm to grow more little black heads which split away from the mother body and become hazards in their own right. While fending off these the player also has a maniacal vulture to contend with as it caws its way across the screen. Enter at this point the tarrantula!

Also dive bombing down the screen is a little green mosquito, dropping more cacti to fill the spaces of those previously shot up. Points are scored by killing the various moving participants apart from the tarrantula which is invunerable as it rests on the lowest line of the screen.

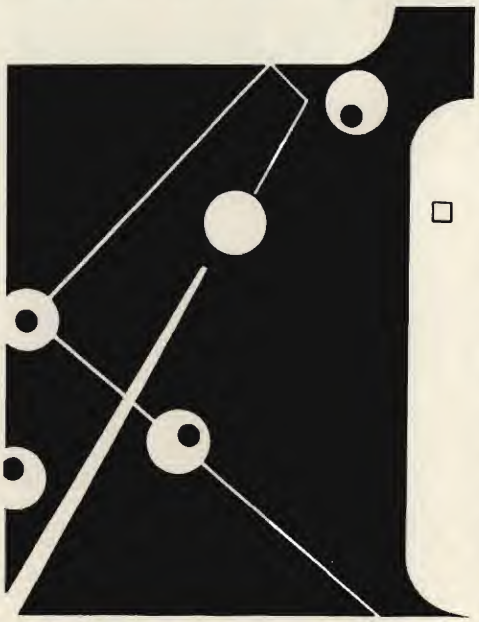
When the player has managed to survive long enough to kill all the parts of the worm the screen changes colour and two worms then begin to descend. An extra life is gained each time the player scores 10,000 points but as the score creeps higher the vulture becomes positively incensed. It is possible to mastermind the worm into loops at either edge of the screen thus allowing the player to increase his score rapidly by shooting down the high score value vulture and mosquito. This happy situation can prevail for quite awhile until either one of the hazards manages to catch the lulled player. The screen changes colour again and more worms begin to descend. The canny player will soon realise that the outline of the cacti has not changed and by judicious firing he can redirect the worm back into the loop. And off he goes again. Then – horror – the mosquito drops some cacti right in the path of the looping worm and while unaware of this the player eventually sees it advancing on him. Round about now the player will begin to lose his cool and the game will be lost. The player will stumble away from the computer his head reeling with the wild sounds only to be drawn back to get his next fix, for by now he will be so totally addicted only a power failure will be able to release him.

This game can be played using the keyboard but we found the joystick to be more exciting.

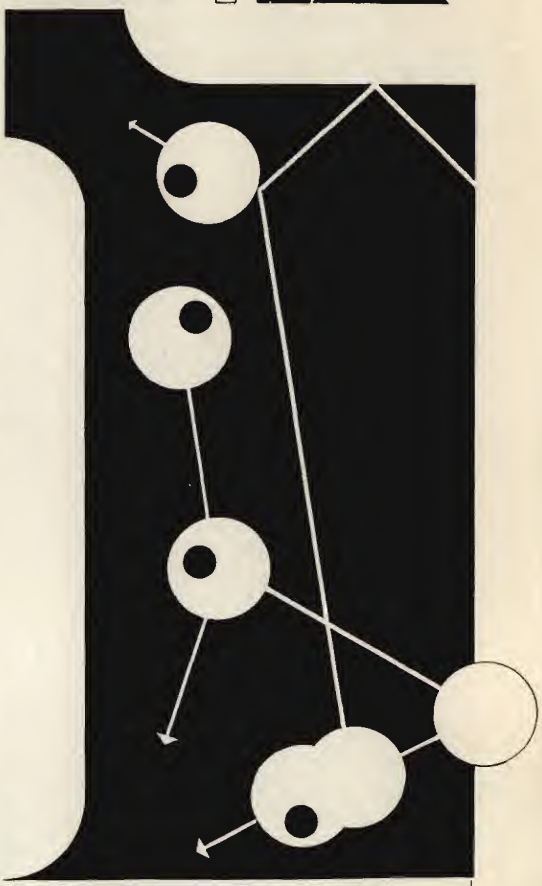
Hustler

This is another offering from Bubble Bus and one that will delight Pot Black enthusiasts. Displaying the shape of a billard table the game is introduced by the theme tune of Pot Black while the instructions are delivered.

The player is offered six types of game to play. After selection, the game appears on the screen and is then played using a



little white cross with which the player determines where his shot will go. There is a strength of shot factor displayed on the lower right hand of the screen for this purpose. The only trying quirk of this game is that the cross moves at first quite slowly but then flashes across the screen and the player has to spend time trying to find it again. Again this game can be played using the keyboard or a joystick.



Crazy Kong

Crazy Kong is another fast action game but this time the package comes together and the play is exciting. The aim of the game is to rescue the maiden at the top of the four levels. The player's ascent is hindered by the need to collect all the diamonds hanging from the ceilings, these he needs to give to the maiden before being able to pass through to the next game stage. Along the way there are also some useful hammers growing from the ceiling. They have a time limit on their effectiveness but their power lasts long enough for the player to gain the height of the fourth level where any power left in the hammers becomes ineffective. The ploy here is to wait until there is a gap in the balls being rolled down by Kong and then leaping over them to gain the second game level. The second game level involves complicated manoeuvresalong conveyor belts and up ladders while deadly fireballs rain down from above. Unfortunately no one has been able to progress further, but no matter,the game is sufficiently enthralling trying to get where we have.

Interceptor

The games from Interceptor are divided between the Vic and the CBM 64. They are all quite ingenious and make excellent use of the capabilities of each machine.

SOFTWARE REVIEW

Frogger 64

Frogger 64 is an attractively presented game that makes full use of the colour capabilities of the 64. The 64's sound too comes into effective operation, a funny almost mandarin-like tune plays when the frog is operational with the standard explosion sound when he dies.

The keyboard control positionings are very comfortable and more accurate than the joystick. The hazards to avoid are standard to this type of game, there being crocodiles, logs, cars and trucks to watch out for. On the death of the frog there appears in its place, a skull. But these trials are easily supportable by the frog because of the bonus he receives on landing atop a lady frog. Altogether a moderately paced game that is fun to play.

Panic 64

Panic 64 is an exciting game that when played with someone watching becomes hilarious. The player controls a little black man who has the job of blowing holes in walk-ways in an effort to destroy little monsters that are chasing him. The little man has the option of climbing ladders and running away. As each game progresses the monsters must fall from high levels before the fall will kill them and although the man is not harmed when falling through these holes he must exercise caution as to their placing. Many is the time he will be trapped with no escape. A sense of deja vu takes over as the monsters converge and take their revenge. The game at first appears easy to play but within a very short space of time the player realises it's not quite as simple as it seems. An excellent game.

Spriteman

This program, while being as amusing as the original it is taken from, falls short on parity of control. The program is written in such a way that the yellow sprite eater has to be exactly positioned before it can go through gaps – hence the ease with which the sprite men are able to gobble the yellow eater up. On the second level of the game an added bonus opportunity is given when two fruits appear, strawberries and cherries. The sprite men are given names which don't mean very much while the game is in operation. They are: Zippy – red, Stilty – blue, Gippy – green and Chris – brown. An interesting game once the user has managed to master the controls – either keyboard or joystick.

Scramble

This version of Scramble is pretty awful. There are too many keys with too many functions and the action is so fast that there is too much to think about while trying to work the keys. The packaging write up indicates that there is the facility to use a joystick but in actual play it does not. The game ought to be withdrawn and worked on a little before being re-released.

Next we review the games for the Vic 20 supplied by Interceptor. These games will all run on an unexpanded Vic and are operated either by the joystick and/or the keyboard. There are three non space games and two that are, so first the down to earth games.

Frog

Frog is the Vic 20 version of Frogger. There is a 30 second time limit for each crossing – it is best to use the joystick for this game as the operating keys on the keyboard are inconveniently laid out. After crossing the road safely the frog must then negotiate to the docking areas by jumping onto and travelling with the turtles and logs. When the turtles turn blue through being asphixiated by the player's weight they 'turn turtle' and dive to escape. A bonanza bonus of 2500 points is gained each time the player is able to spell the word frog when he docks. The game is very tricky especially when trying to cross the road, nine times out of ten the frog will be squashed or knocked down, but once over the rest is plain sailing. The game is well thought out and maximizes the capabilities of the Vic.

Crazy Kong

This Vic 20 version of Crazy Kong is more difficult than the CBM 64 version. The game starts at the conveyor belt level albeit in a different format to that of the 64's. The player must jump down onto a dropping girder – and for those games buffs out there who may scoff, this is tremendously difficult for at the bottom if the player has survived that far, he must immediately jump a square obstacle and then a custard tart all in the space of a few moments. Phew! Even then the difficulties continue as the player realises he's on a fast moving belt going in the opposite direction from the one he wants. And that's not all! The write up on the package indicates that it gets even more difficult, may all you stalwart players attempt and win this game – you will then indeed be worthy of any accoladesthat may come your way.

Now the space invader type games.

Jupiter Defender

This one is a nifty fast action game similar to scramble, though with this one there is no cavern to manoeuvre through. Incorporating a feature that is not available in the game scramble, Jupiter Defender has three secret and smart weapons that the aliens know nothing about.

The game begins with a mountainous region passing along the bottom of the screen, the player has his ship facing right and using the joystick can go in any direction but reverse. The player also has the ability to use thrust forward power at a fantastic speed. His task is to shoot down the marauding forces which include landers, baiters and the infamous pods, which when hit explode into a mass of lethal red mutant swarmers which are almost impossible to pass as they zap around the screen. Just when the task seems hopeless and the screen is full of invaders the smart player will release one of his secret weapons by hitting a key on the keyboard and collect lots of points as all the aliens explode and disappear. The player has three lives and only three secret bombs per game, so he must use them wisely. This game rates as one of the most enjoyable in this package.

Penny Slot

Penny Slot is a good attempt at creating a one armed bandit type of game for the Vic. The only unfortunate aspect of the game is that all the fruits on the reels are in green. There are the nudge and hold features programmed into the game at intervals which ensure that the game remains interesting. The stake, as the name suggests is one penny a go. The keys used in the operation are 1, 2, 3, – to

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SOFTWARE REVIEW

control the reels when a nudge of hold facility appears. These are indicated by two different sounds. 4 enables the player to cancel a hold and return feed the penny in. To the right of the reels there is a nudge count which revolves 1 thru 9. When the nudge feature is available the nudges count down rapidly so the player must maintain a constant watch on the reels and be prepared to move fast when he hears the nudge tune begin to play. Prizes range from 2 pennies for an unripe cherry to 10 pence for three bars.

Vic Rescue

Vic Rescue is a deceptively simple game at first glance. The mission is to rescue six little people from the planet surface while dodging alien space clouds. Once the emergency pod is released from the mother ship it has to navigate through the storm of aliens using the left/right and thrust factors. On a successful landing it collects one man and blasts off up to the mother ship, this time the thrust factor becomes a laser and the storm of aliens, identifiable as ships. The game is over when all emergency pods have been lost or when all the stranded people have been saved. Neat and fast it is a good game for the Vic 20.

Although it was mentioned at the beginning of this review that the games were all from either Bubble Bus and Interceptor, another game came into the office that we feel warrants inclusion. The game is 'Battle of Britain' from Maincomp Ltd, and is for the Vic 20 with 16K expansion, although there is a version for the 64.

Battle of Britain

Battle of Britain is a strategy war game requiring considerable skill by the player or players (up to 12 can participate, sharing the cities between them). You are in command as the War Minister, one error of judgement, one mistake and the course of history could be drastically changed. The battle commences and the observers warn of approaching enemy attacks on a particular city and advise the player of the height at which they are flying. The player by using his radar, can also keep himself informed of other enemy movements as well. Anti-aircraft guns fire automatically, giving each

station commander time to plan his movements. The player will issue the scramble alert and fly off to defend the city. The player may also draft in more aid from nearby air fields. This is by no means the total aspect of the game for each city is also responsible for supplying vital war supplies such as fuel, steel, ball bearings and food, all of which are vulnerable to attack. When the fighting has ended and the all clear sounded, the cities bustle about making more reserve aircraft for the Minister to call on. It is also possible to convert some of the supplies in each city into new aircraft. Initially before the game begins the player was asked to input the amount of German bombers and fighters, ensuring that there are not less than 500 of each and no more than 9000 bombers as this would make the game too difficult. You as War Minister however have no such problems as new aircraft can be made. However around about this point you will have realised that there can only be a certain amount of aircraft stationed at each airbase, according to the size of the base. The game is over when there are no more Germans left or you have played so badly as to have lost all yours – this is doubtful though for the game can go on for many hours with new aircraft being manufactured all the time.

The game is played entirely through reading information and directing the action through orders, although when the ack-ack guns are firing there are explosion flashes going on around the outside area of the screen. This game is a truly tremendous achievement forthe Vic 20 and one that is guaranteed to hold the players attention for hours of fun.

Area:	*Software games*
Companies:	*The Computer Room (Bubble Bus)*
	Interceptor Micros
	Maincomp Ltd.
Addresses:	*Bubble Bus* *87 High Street* *Tonbridge, Kent*
Tel:	*0732 355962*
	Interceptor Micros *Lindon House,* *The Green,* *Tadley, Hants.*
	Maincomp Ltd. *1-2 Cambridge Gate* *Regents Park* *London NW1 4JN*
Tel:	*01 487 5435/6*
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Check Your Bank. (CYB)

As the name suggests, this program enables you to keep a running check on your bank account. The program has full capacity for Standing Orders and Direct Debits.

The program comes on disk with a fairly comprehensive manual so that you can learn how to use it.

Getting started

All that is needed to use this program is a PET 3032 and a disk drive. A printer can be used if you wish to have your personal statement in hard copy form.

There is only one program on the disk and when loaded and run, you are ready to enter your transactions. These may be entered onto a new sheet, or if you have been using it before and saved it off, you can recall it and add onto it.

The Commands

When the program is run, a list of control options appear on the screen. Pressing 'H' will give rise to yet another screen full.

There are a fair number of commands available giving the ability to change Standing Orders to changing the case of the display.

Entering Transactions

The first thing to do when entering transactions is to set the date. This is done simply by pressing 'D' and then entering the date in the standard format of 'DDMMYY'. This must be done as when you wish to update the statement, any standing orders must be updated and added in if they are due.

Usually, the first transaction on a file will be the opening balance. This is easily entered following the instructions in the user manual. There are four sections to one transaction, these are the date, which is entered as a two digit number followed by a three letter abbreviation of the month.

The next section or field of an entry is a nine character details column where you may put a description of the transaction. The next field is a ref field which is a three character identifier which could be the last three numbers of the cheque. The last and most important field is the actual value. This must be entered either in the debits column or the credits column depending on whether it was paid in or taken out.

Other transactions are entered in the same way until you have entered all of them up to date.

File Handling

The package has a few disk handling commands, specifically: 'I', 'S', and 'L'. These are respectively to initialize a drive, save the current file and load a file into memory. It must be noted that once the program has been run, a file must be written to disk before the command 'X' can be used to exit the program (nice safety precaution).

Checking Off

When a statement arrives from your bank, you may check it off by moving the cursor over the transactions and 'ticking' them off against the statement by pressing the reverse key. If the wrong one was accidentally ticked, it may be cancelled by pressing the reverse off key.

Output

The program also allows your personal statement to be output to printer, printing either all or part of your record.

Sub Totals

Sub totals may be inserted anywhere in the display. This can be very useful when separating ticked items from un-ticked items. To separate them, pressing 'R' will reformat the ticked items above the un-ticked ones and a sub total may be inserted between the two sets of information.

Conclusion

At a relatively low price of only £19.95, this is a very good and useful package and I know that I will be using it myself from now on.

Area:	*Business Software*
Title:	*Check Your Bank*
Price:	*£19.95*
Configuration:	*PET BASIC 2.0, VIC-20, or CBM-64 with disk drive and printer (optional)*
Company:	*Roxsoft Ltd.*
Address:	*166 High Street Hounslow, Middlesex, TW3 1BU*
Tel:	*01 570 5783*

SOFTWARE REVIEW

Micro Simplex

Putting the Simplex 'D' Account Book on the 64.

Almost for as long as anyone can remember, records of small firms accounts have been kept in a book called the Simplex 'D' Account Book available for many years from many good stationers. Technology changes many things and one of the more recent changes concerns this book, because it has now been put on a disk compatible with the 64. This version is called Micro-Simplex and is available from the highly reputable company of Micro-Simplex Limited.

The disk we received at the offices of Commodore Computing International was put into a 3040 disk drive and the high quality results were viewed on a Sony television set. Loading was fast and completely free of errors.

This program is designed for people who own small businesses like a grocers, newsagents, garage, estate agent and need to keep an accurate account of the financial incomings and outgoings of the business on disk. It is possible to view what is actually on the disk because there is the choice of having a rolling demonstration or making use of the user interaction. In the case of the rolling demonstration, all the user needs to do this is sit back, watch, ignore the 'press any key to continue' and the various questions and just enjoy what you see. The other choice is the user interaction which allows you to input your own information.

Exactly what kind of information field is provided by the system? All the information is controlled by a series of menus and, immediately on loading up, the user is put into the main menu, which is simply a list (and a very comprehensive one at that) of account programs, the one that is going to be used most often being Data Input, as this accepts information for the day like stock payments and takings.

Most of the options available are similar to each other in that each display is very clear and easy to read. Take the example of payments for business stock, which is the field where all records of purchases are kept. However, to avoid confusion with other fields, it is designed to be used for payments made on the day and not for things like unpaid bills which have a section to themselves. The opening box of payments for business stock is a very important one. Every time an entry is made, that entry is given a payment number and should thus be entered on the document you are entering. This is then followed by the analysis code of which there are 10 codes that are user-definable. For instance, code 01 might refer to an item like rubber, code 02 to ball bearings etc etc.

The third piece of information to be filled is what is called the date/cheque which is self-explanatory: all you have to do is enter either the date or the cheque number. To complete the display, all you have to do is enter the person to whom the amount was paid, the actual amount and the VAT content.

Viewing the data is, perhaps, a little longwinded. As soon as you ask to do this you must re-load the program disk so the 64 can load the program required and then, in order to view the information required you must change the disks again. There are several options associated with viewing the data, these being classified as the total receipts/paid to bank (which then makes another menu visible displaying several options accompanied with the day) which gives a full and comprehensive account of all the weeks payments to the bank. An example of this is the fact that in week 12, Friday 08/04/83 Andrew Jones's garage paid £700 into the bank followed two days later by a payment of £535 giving a grand total of £1235. You could also view the summary for the week which gives the total takings subject to VAT. As referred to before all unpaid bills must be kept separate from the bills paid on the day. The function of this is to enter any bills which are not going to be paid until later. To pay any such bills, you must enter the voucher number which cannot be more than five digits long and once this has been done the rest of the screen is completed automatically. In this case the details include the name of the firm, the account number, the date of the invoice, the amount and the VAT element in the amount.

The theory fits the facts but is obviously nonsense. If we plotted other information on the graph – rainfall, sales of woolly jumpers, temperature, ice cream sales – we would eventually come to the conclusion that the relationship between lager and oysters has to do with the increase of temperature in the summer.

Seasonal variations are obviously very important to many businesses, large and small. Failure to identify such seasonal changes could lead to disaster. Take the example of the businessman from Mars who had made his fortune selling Earth bars. He decided to try and break into the Earth ice cream market.

He started trading in January and sales were miserable. They started to pick up in May so he increased production. In June, July and August sales rocketed and so did production. But in September sales plummeted. And just at the time when all the bills were coming in for the extra materials used in increased production.

Depressed, he went off to Venus where he sculpted the Earth de Milo and had a hit with a song called Earth in Blue Jeans. If only he had looked at graphs of sales for previous years he would have seen that sales always fall off in September and could have adjusted production accordingly.

Although graphs do not enable you to predict exactly what will happen in the future they can help you to make an intelligent estimate about what is likely to happen next. Although graphs have many serious uses they can also be entertaining. Once you have grasped the idea there's nothing to stop you plotting what you like. But it need not necessarily be trivial.

You could, for instance, use graphs to help you decide when you should sell your car. Plot the annual depreciation in value of your car (the motoring organisations advise members on figures) and then estimate the annual cost of repair and servicing. The sum of both figures is the annual cost of running your car before

petrol, road tax and so on.

If you plot the cumulative totals for both you will get two curves, one upwards (costs), one downwards (value). The point at which they cross tells you when you have spent as much on the car as it is worth.

Introduce another line, the cost of your model of car if bought new (should be gently curving upwards) and the graph becomes even more interesting. It would obviously only happen in unusual circumstances but an ideal time to sell would be when the cost of repair and service during the year, plus the value of the car equals the price of a new car.

An even more interesting and potentially useful application of the graphic display of information is in deciding when to move house. Plot the value of your house over the remaining period of your mortgage and then plot the the amount of mortgage you have left to pay. The difference between the two lines is the 'profit' you would make if you sold the house.

If you plot the profit separately and then plot the amount you are likely to be able to afford as a mortgage, then the sum of these two will be the price you can afford to pay for a house. If you have a dream house in mind you could also plot its ever increasing value. If the line describing profit plus affordable mortgage does not cross the line describing the value of your dream house then you will never be able to afford the house of your dreams.

There are many more uses of graphs and so far we have only scratched the surface. Over the page, for instance, there's a graph which enables you to display seven blocks of information on three levels, or three blocks on seven levels! And pie graphs make displaying proportions easy.

The end of the year or at any user-definable period, most businessmen need to prepare a set of final accounts. In this system this is catered for in the summaries section. Summaries can be for either one week or any other specified period. Neither is the summary subject solely to an analysis of the weekly takings. It will also include such things as the summary of goods purchased and payments for expenses.

As so often with this program, practically everything has been catered for right down to the minutest detail. Summary displays take into account the week number, amount, the total sum for the four quarters of the year plus the total sum for the year. Neither does it concern itself with the summary of takings in this form because there is also a clear account of the years weekly summaries for goods purchased.

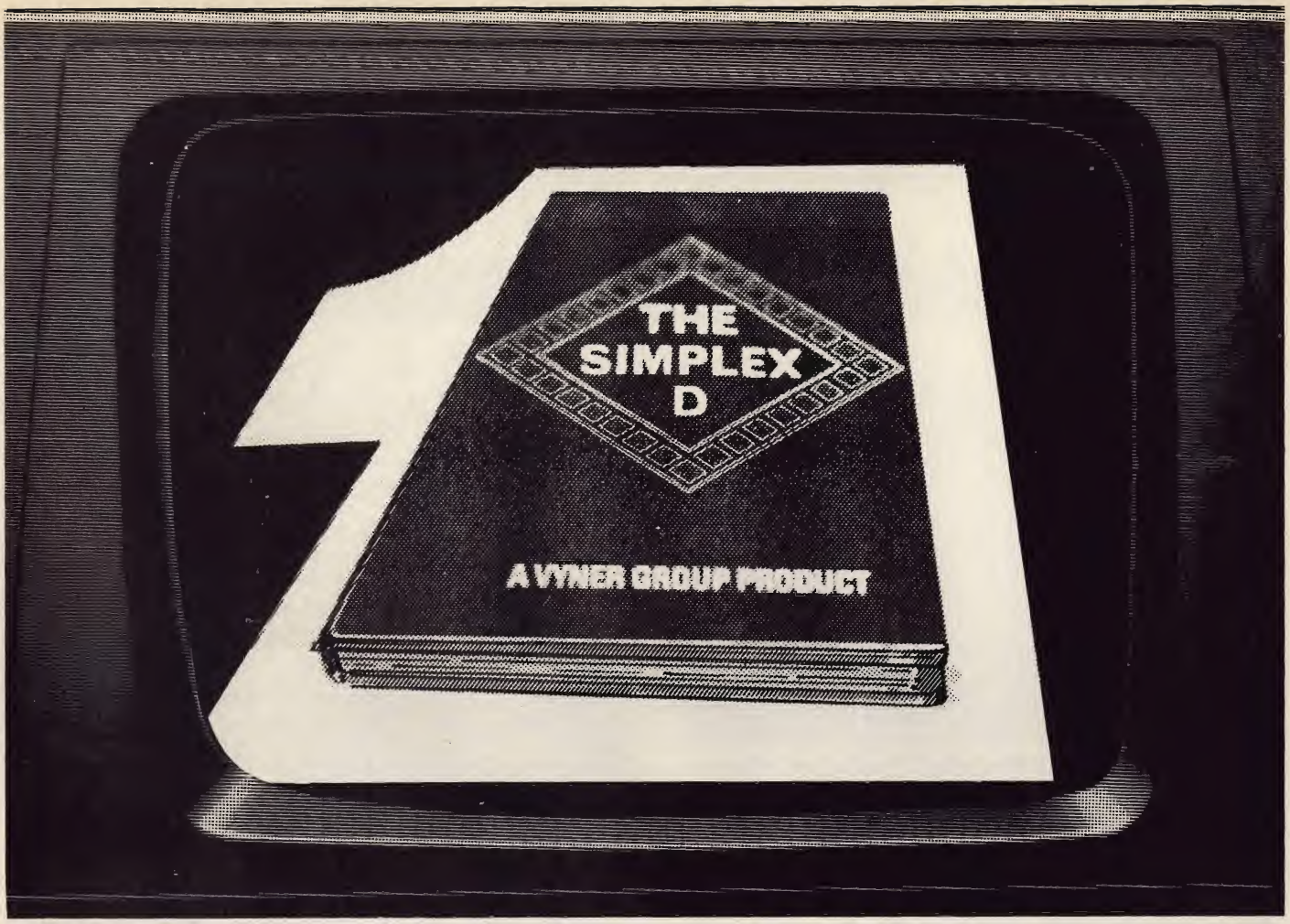
So far everything has been very simple, and even if not all the drudgery involved in completing business accounts has not been removed, the vast majority has. We now approach the audit trail and, to the credit of Micro-Simplex Limited, this is also fairly simple to perform. The audit trail is basically a list of all payment transactions entered into the system from the start of the financial year. It is made up of the transaction number, analysis code used, to whom the amount has been paid, the date or cheque number, the value of the invoice and the value of the VAT element. Back to the main menu, the third option is data print. At any time you can printout a set of reports including a full report which is the obvious option to select if you wish to see all your records at the end of the week. Apart from this, the only other item so far left unexplained is the close down or final accounts, which are the accounts prepared at the end of the year to determine the extent of the years profit or loss. However, before this can be accomplished, you need to know the closing stock figure, which is basically a normal stock-taking exercise, the results of which are recorded and valued. The closing stock figure is the sum of all the items added together.

The final accounts are made up of the Trading Account and the Profit and Loss account. This is perhaps the only bad point about the whole system because these accounts have to be made out manually and should include the purchases made during the year, the closing stock, the sales and the value of goods taken for your own consumption. The Profit and Loss Account comprises of wages, depreciation of goods, Customs and Excise VAT payments and VAT on capital items. Along with all this, Micro-Simplex Limited are adding lots of 'peripheral' benefits, one of which is the Micro-Simplex Users Club which provides you on registration with a free security copy of the program disk. The £25 to join the club means that you will receive notification of all the updated versions of the program, issues of Micro-Simplex News (a forum for regular contact with other Micro-Simplex users) and free disks if any changes take place in the VAT legislation or accounting rules.

Micro-Simplex Limited also have an arrangement with Her Majesty's Customs and Excise whereby they are notified of all users. This is done to ease the job of the VAT inspector and make his visit to you as easy and uncomplicated as possible. Micro-Simplex has been examined by VAT experts and satisfies the current legislation and means that he does not have to spend much time with you. This arrangement is not wholly one way. H.M. Customs and Excise keep Micro-Simplex Limited informed of any problems encountered by users as well as any unauthorised copies of the program being used. Now there is an original security device for you!

In conclusion, this is a very handy package for the small businessman which nobody should be without. Micro-Simplex Limited are experts when it comes to producing business packages and this one is no exception.

Product:	*Micro-Simplex 64*
Area:	*Business Accounts*
Configuration:	*64, disk drive, printer, monitor*
Company:	*Micro-Simplex Limited (trading under Catlands Information Systems Limited)*
Address:	*8 Charlotte Street West, Macclesfield, Cheshire 8K11 6EF*
Telephone:	*0625 615375*



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Other features include . . .

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- Simple and familiar layouts
- Easy to use
- Automatically produces:
  - (a) Statements to customers
  - (b) Lists of unpaid bills
  - (c) Simple profit and loss accounts

MICRO-SIMPLEX

MICRO-SIMPLEX

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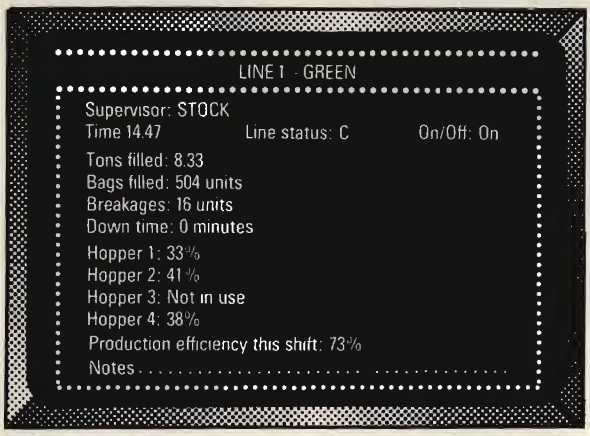
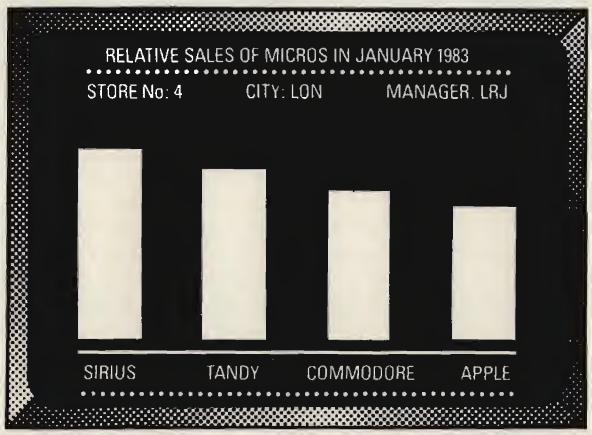


Controlling the production of tomato grow bags may sound simple enough, but co-ordinating *all* the different aspects on a brand-new production line was not without its headaches. When the production manager turned to the company's new micro for an answer, it was THE LAST ONE which made it possible to create a system in hours rather than months. TLO then went on to produce over *one hundred* individual solutions for this company in a period of less than a year.



A simple, moving, graphic display was needed by a major computer retailer to demonstrate how a new product line could maintain compatibility with some of his earlier machines. Half an hour's work with THE LAST ONE and he had a program displaying bar-charts, graphs and printouts. Little more than an hour later the same program was up and running on three other makes of micro. When asked what made the four machines compatible, he laid the credit squarely with THE LAST ONE – "some manufacturers would be hard put to even use the same mains plug – TLO at least gets them all speaking the same language."

Using a computer to solve a complex problem is not always as easy as it sounds.

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Volcanic Games for your Vic 20

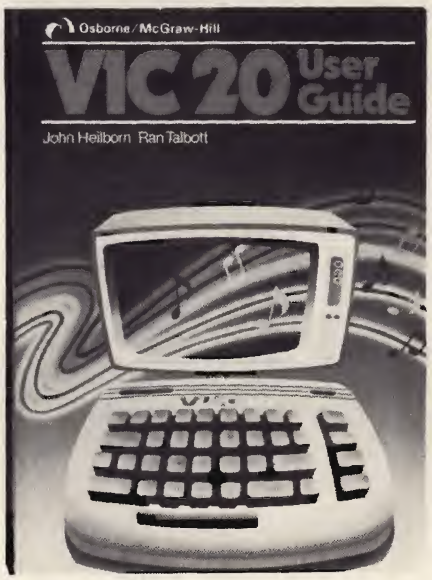
Hal Renko and Sam Edwards

At first glance the most striking aspect of this little book is that it is almost the same size as a floppy disk. At this point one could begin an interesting train of thought about the consequences of micro technology on the printed word. Here we have a book which when matched with a floppy is only slightly larger in area, but is five times as thick. Contained in both (if the games were to have been entered thereon) presumably would be the same information, each on their own useless without other equipment...

However, we are reviewing this book not philosophising so, onward. The book contains 30 games of which 5 require expansions ranging from 3K to 16K. The format is simple and easily understood. A small helping of descriptive wording, generally about a page, then the required amount of listing interspersed with line drawings. There is a strong Dutch influence throughout the book, not really surprising when one reads the acknowledgments. The main aims of the authors are to provide games which will interest and amuse people of all ages from 6 to 96 although ones own experience with children these days indicates that not a few of the gameswill interest children younger than 6 years old.

On further indepth perusal of the games one comes to the conclusion that a great deal of mind twisting will result in a new ability to exercise the grey matter to a higher degree. This book is of excellent value and if the publishers had been more inventive a disk could have been slotted in the back to ease the tedium of typing in the listings.

Title:	*Volcanic Games for the Vic 20*
Authors:	*Hal Renko and Sam Edwards*
Publisher:	*Addison-Wesley Publishing Company*
Price:	*£3.95*



Vic20 User Guide

John Heilborn and Ran Talbott

At last, from Osborne/McGraw-Hill the book that Commodore should have had when they launched the Vic 20. On the first dis-interested glance through the book ones attention was instantly caught and held throughout a more avid ingestion of its knowledge. The book begins where everyone who buys a Vic begins, on the first excited inspection of the equipment as it is lifted from its packing. Inch by inch the text leads you around the Vic, supported by photographs, detailing all the external features and then on into the functions of each key. Following on, it details the functions and uses of the peripheral equipment that support the Vic.

Chapter two delves into the world of operating the machine. Exciting things like actually being able to type in a program and edit it, verifying, loading and running the new users first program are dealt with simply in readable, understandable English. Instruction on the saving of the first program and then printing it, are then dealt with, although one soon realises that one can't save it without having first formatted the disk.

This instruction comes after saving, to do this one has to quickly type in the required instruction and then its onward again.

Chapter three deals with programming the Vic and chapter four follows this up with more advanced BASIC programming but never at a pace where the beginner is liable to get lost in the text.

Chapter five brings the tyro games writer a little closer to the ultimate by dealing with such things as the joystick and the necessary instructions to the computer to operate it. The chapter goes on to detail how the keyboard and the paddle may be used to manipulate characters around the screen. It also guides the user on the best combinations of keys from the keyboard to use – thus eliminating the awkward finger positionings that some writers of programs still use.

Chapter six leads the programmer into the colourful world of Graphics. Wonderful terms which previously remained incomprehensible, such as hi-res and multi-colour mode etc, become instantly understandable.

Chapter seven deals with the Vic sound registers and reads almost like a music manual explaining the various sounds and methods of creating such things as fading tones, attack/sustain and decay, pulsed and sweepings of the scales, all very easy to understand when read. This chapter opens up a world apart from computers and yet one that can be so closely linked that many great works these days have been written using a computer. Indeed one great instrumentalist – Mike Oldfield – regular-

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BOOK REVIEW

ly uses a computer to help him gather together his wonderful sounds.

Chapter eight handles the functions of many differing peripherals from cassette to disk, filing and printing. The rest of the book is taken up with appendices which goes into the more highly technical aspects of the machine and its functions. By this time the new beginner will be almost an old hand and as such will be ready for this. A long awaited book bursting with vital information for new and old users of the Vic 20.

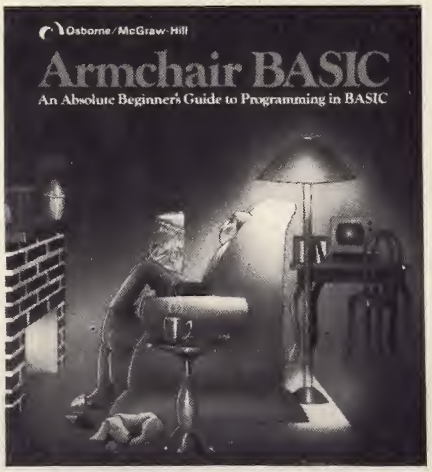
Title:	*Vic 20 User Guide*
Authors:	*John Heilborn and Ran Talbott*
Publishers:	*Osborne/McGaw-Hill*
Price:	*£10.95*

Armchair Basic

Annie Fox and David Fox

This book is written by a pair of Americans who have a chummy friendly style of writing. They opened one of the first public access micro-computer centres in the USA and came across many people who just did not know how to interpret the available books on Basic. They set themselves the task of writing an interesting easily understood lesson of Basic and judging by the content and style of their book they have managed to do just that.

Chapter one deals with computing the subject and why it evolved. From recording the number of mastodons



that were felled during the hunt to totalling tax deductable purchases, the species of homo sapiens has been obsessed with quantifying aspects of our daily existance. This chapter takes the reader through a time portal to explore first-hand those moments in history when breakthroughs in computing were made.

Chapter two explains everything the reader wishes to know about the computer and the instructions that make it work. This chapter talks about the vast, yet hopelessly inefficient human memory and its computer counterpart. Chapter three deals with the 'print, list, run and new' commands, the simplest in BASIC. This chapter explains them in fine detail and from every angle possible.

Chapter four wends its way through the computers electronic filing cabinet, how to store in the computers memory and how to get that information out again.

There are eleven chapters in all, each concise and friendly to the reader. Illustrated here and there with cartoons to give a lighter feel to the information so liberally spread between the pages, the whole impression of this book is one of ease, care and a determination that everyone who reads it will be able to take up the challenge of a new language and enjoy the use thereof.

Title:	*Armchair Basic*
Authors:	*Annie Fox and David Fox*
Publishers:	*Osborne/McGaw-Hill*
Price:	*£9.95*

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PRINTERS

Since the microchip revolutionised the whole business world, the printer too has had its part to play. An essential part of any word processor, electronic typewriter, home or business computer, the printers role is to print on to paper whether it is fanfold, headed paper or envelopes, what has been typed in or recorded in the computers memory. The typewriter cannot possibly compete with the speed that these printers poduce printed matter, small business can send as many good quality copies of the same letter as it needs in a fraction of the time, lists of invoices, stock prices, processed data etc can be produced at the push of the button.

What is confusing is the awesome variety of printers currently on the market, as the various companies introduce their latest 'piece de resistance' incorporating the newest designs and technological expertise. The task of this article is to feature a few of the printers on the market; the standard 'no frill' models, the slightly more expensive models and the fancy multi-mode models. Although it is not a comprehensive list of every printer in production, we have tried to give an idea of the wide range available.

Printers can be divided into two main categories, the data processing quality dot matrix which generally prints speedily and the letter quality daisy wheel. There are also a few which combine these qualities and have extra abilities like graphics and colour print. Printing speeds, prices, paper handling facilities and character sets all vary considerably and before choosing a printer it is advisable to consider exactly the functions that will be needed, the money available and then look around carefully. There will be a printer somewhere that fits your price and needs.

DRH 136

A dot matrix printer has a print speed of 120 characters per second and is suitable for users with a need for a high volume of printed output. It has a Ballistic print head with a 7 × 9 dot matrix, and has the option of an 18 × 18, or a 18 × 36 dot matrix OCR A1-type style. It prints bi-directionaly along an optimised print path and can produce three copies at a time. Line spacing is variable and can be selected by software, the line length, which can also be altered can be set at 10, 12, 15 or 16.5 characters per inch giving a total of 136, 163, 204, and 224 characters per line respectively. Different form lengths for various applications can be selected via software, thus avoiding manual adjustments to the tractor feed each time the program is changed. There are several character sets; 96 character according to the DIN 66003, 11 national character sets and 32 mathematical and technological sets. Type styles include normal, wide, micro, index and exponential, Graphics available are the Semigraphic, Linegraphic and the pin controlled graphics. Features include the horizontal and vertical tabulation and a selftest function. The printer has a Baud transmission speed of 110 to 9600, a 2K Byte character buffer, and is compatible with the Serial: V.24 (RS232) and the Parallel: Centronics.

Price: £675+Vat
Address: 27 Goswell Road, LONDON EC1M 7AJ
Tel: 01-250 1717

DRH 80/1

The lowest priced printer in the range with a printing speed of 80 characters per second. With the ballistic print head and its 7×9 dot matrix, the DRH 80/1 can print 80 characters per second, bi-directionaly with an optimised print path. The characters can be printed in a variety of styles; upper or lower case, Normal, Wide, Micro, and High type. There are 96 characters in the character set, also available are 11 national character sets along with 32 mathematical and technical characters. The different line spaces are software and selectable and range from 2.12mm to 5.82mm. Variable character spacing varies from 10, 12.5, 15 and 17.5 characters per inch and the corresponding number of characters per line is respectively 80, 100, 120, and 140. Single or paper roll can be fed through platen friction rollers or a tractor feed can be used for printing on continuous forms. There is a 256K Speed character buffer and there is a 110 to 9600 Baud transmission speed. Interfaces compatible are the Serial: V.24(RS 232) and the Parallel: Centronics. It claims to be a quiet, reliable machine and would be ideal for reports, records, tables and analyses.

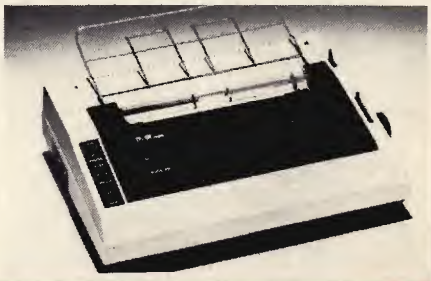
Price: £540+Vat
Company: Triumph Adler (UK) Ltd
Address: 27 Goswell Road, LONDON EC1M 7AJ

Tel: 01-250 1717

Facit 4510

A fairly basic dot matrix printer with a printing speed of 120 character per second and a variable character and line spacing function. Characters can be spaced from 10, 12 or 17 characters per inch with the 9 × 9 matrix, 10 characters per inch in either monospaced or proportional with a 9 × 15 matrix. The line length can vary from 80 columns to 12 columns using a switch or software commands. For emphasizing words and phrases, the print can be elongated or underlined. The machine is 125mm in height, weighs 9 kg and has a 2K print buffer capable of intelligent buffer handling. Three different types of paper can be handled; continuous sheets with a tractor feed and single sheets or telex rolls using a friction feed. There is a variety of type and graphic styles: normal, condensed, compressed, high resolution, high resolutional proportional, standard block graphics and pin graphics, a transparency mode is also available and with the software commands all the above modes can be done in 3 different resolutions in pin and block grahics. The character sets include 8 national versions for each font, for example 96 ASCII plus, German, Italian, Swedish/Finnish, and Danish/Norwegian. It is compatible with various interfaces – Parallel Cetronics and Serial V.24 (RS 232 C). Features include a self test and a 2K input buffer.

Price: £498+Vat
Company: Facit-Addo Ltd
Address: Maidstone Road, Rochester, Kent ME1 3ON
Tel: 0634 401721

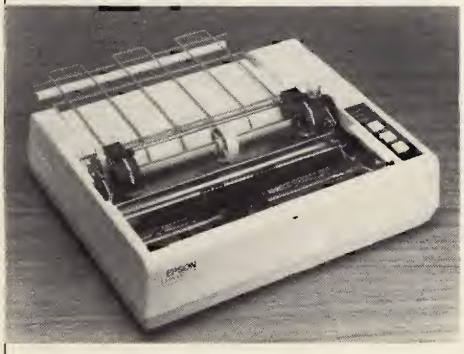


PRINTERS

RX-80-FT

A dot matrix printer capable of printing up to 100 characters per second either bi-directionaly with logic seeking in the text mode or uni-directionaly in the bit image and graphic mode. There is a variety of character styles – normal, italic and elite and there are two full 96 ASCII character sets plus 11 international character sets, including those for the USA, France, Germany, Denmark I and II, Sweden, and Spain. Additional features include the dot addressable graphics, a condensed and double width printing, thus providing a very versatile printing ability. The RX-80 FT can print a variety of different sized characters, for example normal, enlarged, condensed and elite where the maximum characters per line is 80, 40, 137, and 96 respectively. The paper is fed into the printer with a sprocket pin tractor feed for fanfold paper, and a friction feed for single sheets and can produce three copies at a time. The height of the machine is 107mm and weighs 5.1kg. The standard interface used is the Centronics-style 8 bit parallel and there is also the optional IEEE 488 and the Serial RS 232 C. Epson have also produced the similar FX-80 which can print 160 characters per second with proportional spacing, super and sub scripts and down loadable character set. RX-80 Price: £319+Vat and FX-80 Price: £438+Vat.

Company: Epson (UK) Ltd
Address: Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH
Tel: 01-902 8892



DRS 250

A very high speed dot matrix printer capable of printing at a speed of 250 characters per second, bi-directionaly along an optimised print path. There is a widechoice of character sets available, for instance the standard 96 characters according to the DIN 66003 in upper and lower case and the optional OCR-A1, numeric and special characters, and also the 64 graphic characters. The character spacing varies from 2.54, 2.12 to 1.69mm, as does the line spacing; 6 or 8 lines per inch. Paper is transported along a horizontal adjustable tractor feed and it can produce up to five copies at a time. Data can be transmitted via an asynchronous system or an optional synchronous system and there is a 75 to 19,200 transmission speed. A 512 character buffer is available and the Serial: V.11 and V.24 and Parallel: Centronics interfaces are compatible. It is especially suited for Remote data processing, Multi-terminal systems, Screen workstations and any situation where a high volume of printout is needed.

Price: £1,495+Vat
Company: Triumph Adler (UK) Ltd
Address: 27 Goswell Road, LONDON EC1M 7AJ
Tel: 01-250 1717

DWP 5055

A daisy wheel printer able to print at a speed of 55 characters per second, bi-directionaly with an optimised print path or a selectable incremental print. Interchangeable print wheels offer a wide choice of type styles including normal and proportional and the character set gives a choice of 96 characters in upper or lower case. Line length and spacing are variable, for instance it is possible to fit 136 or 163 characters per line according to the spacing. The easily changed cassette loading ribbon offers a choice of multi-strike or fabric ribbon. Five copies can be printed at a time and the paper is manually transported in single sheets or with the optional automatic single sheet feeder and bi-directional continuous forms tractor feed. Features include double print, bold print, automatic underlining and horizontal tabbing, all available through program commands. Interfaces compatible are the Serial: RS 232 C and the Parallel: Centronics. A 2K buffer for word processing is inbuilt and the Baud transmission speed is 110-9600. This machine is suitable for all applications requiring letter quality printing with a fast throughput.

Price: £1,675+Vat
Company: Triumph Adler (UK) Ltd
Address: 27 Goswell Road, LONDON EC1M 7AJ
Tel: 01-250 1717

TRD 170-S

A daisy wheel printer capable of printing 17 characters per second, bi-directionaly along a logic seeking path. The wheel has 100 characters, special characters and upper and lower case. The wide variety of daisy wheels give the choice of a number of type styles; normal, proportional, and the OCR-B type. Line length and spacing are available with 132, 158 or 198 characters per line. The cartridge ribbon loading enables fast clean ribbon changing and multi-carbon or fabric ribbon can be used. Paper can be manually fed with single sheets or the optional single stack feed for automatic feeding, five copies can be printed at a time. An optional continuous forms tractor feed is also available. A noise level of 57 decibels means that the printer operates fairly quietly. Interfaces compatible are the Serial: V.24 (RS232C) and the Parallel: Qume or Centronics. There is a Baud transmission speed of 50 to 19200.

Price: £725+Vat
Company: Triumph Adler (UK) Ltd
Address: 27 Goswell Road, LONDON EC1M 7AJ
Tel: 01-250 1717

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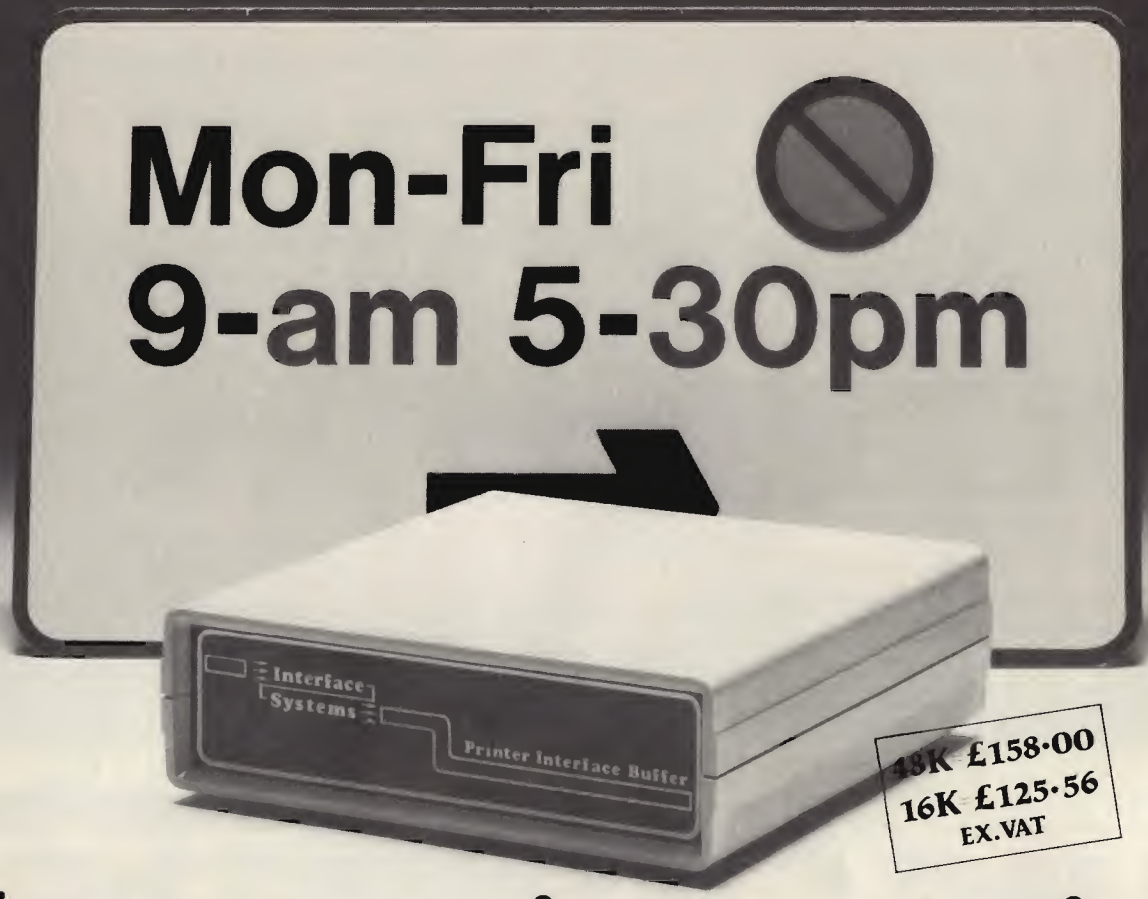

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PRINTERS

Getex D-14

The Getex D-14 is a daisy wheel printer with the wheel enclosed in an easily changed protective cassette. It can print at a rate of 13 characters per second, which is fairly slow, but it has a number of other useful abilities. The red and black colours, shadow printing where bolder print is used and automatic underscoring, all enable words and phrases to be stressed and emphasized. The proportional spacing function ensures a uniform appearance. Dur to the large memory capacity on the 3K buffer, text can be reprinted in large quantities independently of what is happening on the personal computer, so while the copies are being done, the computer can still be used. The print wheel has 96 characters, and the ribbon cassette has a choice of four ribbons; single strike, multi strike, fabric and a correctable ribbon. A friction platen feeder takes the paper at a rate of 2.5 inches per inch, bi-directionally and can produce five copies at a time. Optional Accessories include CCTractor feeder for Data Processing, an Auto-cut Sheet Feeder for Word processing and a low-profile keyboard which converts the printer into an electronic typewriter. Interfaces compatible are the Serial RS 232 C and the Parallel Centronics. This printer can be converted into an electronic typewriter by joining it to an optional keyboard and an automatic correction capability is included.

Price: £475 + VAT
Company: Geveke Electronics Ltd
Address: Vale Farm Road
Woking
Surrey GU21 1DW
Tel: 04862 26331

Diablo 620 RO

A daisy wheel printer capable of printing up to 25 characters per second and is compatible with the Diablo 630. Column and line spacing are variable and there is a 98 character set and a word processing set. It has three print pitches; 10, 12 and 15 with the respective column length being 132, 158 and 198. The plastic print wheels are encoded and there is a new ribbon system which is easy to change. Other features include a margin control which can go left to right and top to bottom, a tabulation function enabling the tabs to go horizontal or vertical. The Diablo 620 Ro also has the ability to self-test, control a programme through escape sequences, automatically print in both directions and can support languages written from right to left. There is a 512 byte print buffer. The paper is fed bi-directionally in a direct line or by form. Optional paper handling Accessories include a bi-directional tractor feed and a cut sheet feeder. The Serial interface RS 232 C is compatible and the Baud transmission speed ranges from 110 to 300.

Price: £975 + VAT
Company: Geveke Electronics Ltd
Address: RMC House
Vale Farm Road
Woking
Surrey GU21 1DW
Tel: 04862 26331

Diablo 630 API

A model similar to the Diablo 620 RO with a number of additional features. It can print up to 40 characters per second and has variable column and line spacing. A choice of plastic and metal daisy wheels are available, the plastic wheels have 96 characters and on the metal wheels there is a selection from the 88, 92 and 96 character wheels. Column and line spacing are variable and the maximum form width the printer can take is 16 inches with paper out and 16.53 inches with paper in. Print pitches available are the 10, 12 and 15 which can respectively fit 132, 158 and 198 columns on to paper. It is less than 8.25 in. in height and weighs 60lbs. It has an all purpose interface, as the Diablo 630 API can automatically sense and configure the appropriate type of serial or parallel communication. Using the available cables it can be linked with Apple II, TRS-80, IBM Personal Computer and the Centronics 703 Printer as well as hosts using RS232C Serial or IEEE 488 parallel communications. Additional features include bi-directional margin and tabulation control, and a 1344K byte print buffer. It also has Word Processing enhancements and graphics including Diablo's Hyplot vector plotting. Paper is fed through the printer bi-directionally via a line feed of a form feed.

Price: £1,650 + VAT
Company: Geveke Electronics Ltd.
Address: RMC House
Vale Farm Road
Woking
Surrey GU21 1DW.
Tel: 04862 26331

MT80

A competitively priced dot matrix printer for users of small business systems and home computers. It prints up to 80 characters per second with an optimised bi-directional print. Features included in this model are self test diagnostic procedures, a logic seeking operation for th text and a dot addressable as well as a line graphic printing function. Also inlcuded are a variety of print types; 80 column or 132 compressed character print, double height and double width characters suitable for displayed heading, enlarged, emphasised and a super/subscript printing modes. Compatability with ASCII code, Epson codes and 7 national character sets gives this printer scope for an interesting variety of printing modes.

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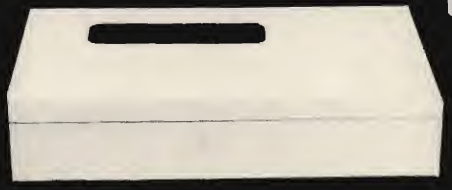

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Oxford Computer Systems (Software) Ltd.
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PRINTERS

Several paper transport systems are included including the friction feed, the tractor feed and cut sheet handling, it also has a quick tear facility and can process up to 3 copies. Operating at a noise level of about 55 decibels and weighing 5.3kg (11lbs) means that this is a quiet and compact machine. Compatability with most of the popular microcomputers is ensured with the choice of serial or parallel interfaces, for example the Commodore range can be connected with the IEEE interface. Additionally an optional 2K buffered interface is available along with several programmable functions, for instance variable margins and horizontal and vertical tabulation. Price of 132-column version: £749+Vat. With Commodore compatible IEEE interface, price: £799+Vat. Price of 80-column version: £285+Vat.

Company: Mannesmann Tally Ltd
Address: Molly Millars Lane, Wokingham, Berkshire RG11 2QT.
Tel: 0734 788711

Olympia ESW 3000 RO

Capable of printing at a rate of 50 characters per second, this daisy wheel printer is suited for coping with large amounts of word processing. The type-wheel contains 100 different characters and can operate two character sets, national characters and the standard US ASCII. For emphasis, bold, expanded and double strike printing modes are available and it can print up to seven copies bi-directionaly with an optimised print path. The print pitch can be changed fro 10, 12 to 15 characters per inch and with each of these pitches, the machine can get 150, 180 and 225 characters on each line respectively. A 4K buffer memory handles all printing tasks, leaving the host computer ready for other uses.

There are several interface options; Centronics, RS 232, IEC Bus, IEEE, and 20m/A TTY and the Baud rate and Dataformat are switch selectable. Optional paper handling equipment includes a Tractor feed and a bi-directional Automatic single bin cut sheet feeder. The control panel functions include keys for on/off line, index and reverse index, form feed, self test, reset and hammer intensity and a ribbon or paper out. Ribbon options include standard carbon, multi-strike, lift off carbon and fabric. A dealer service network around the country, deals with maintenance.

Price: £1,136+Vat
Company: Intelligent Interfaces Ltd
Address: 438 Wood Street, Stratford-on-Avon, Warwickshire CV37 6JQ.
Tel: 0789 2968 79.

Smith Corona TP-1

This is a microprocessor controlled daisy wheel Text Printer capable of printing 120 words per minute. It can be utilized with word processing systems, microcomputers, small business systems or in any environment which requires high quality printing. It prints in only one direction and has adjustable line and character spacing, the print pitch can be changed from 10 to 12 characters per inch with respectively 105 and 126 characters on each line. The wheel is composed of nylon reinforced with glass and can be changed with other snap on daisy print wheels. There is a

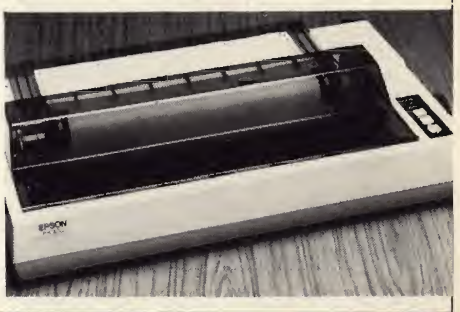
choice of ribbon available; film, fabric and multi strike and the ribbon cassete is easily dropped into position. The TP-1 is available with either the parallel: 7 bit ASCII data and TTL or serial: EIA RS 232 C interfaces. With the parallel, it can print an 88 character ASCII set in either a 10 character or 12 character per inch version. The Baud transmission speed is 110 to 19,200. The paper is fed through the printer with a friction device and can take either single sheets or fanfold paper. It is 16.25cm (6.4in.) high and weighs 8.4kg (18.5lb.) with a noise level of 69 decibels. Suitable for letters, documents, forms, reports, price lists and data sheets.

Price: £346+Vat
Company: Discom Trading Company
Address: Dresden House, 51 High Street, Evesham, Worcestershire WR11 4DA.
Tel: 0386 3591

Epson FX-100

Epsons' latest product is an impact dot matrix printer incorporating all the features of their FX-80, but with a wider carriage. It can print 160 characters per second, bi-directionaly with logic seeking and has a variety of print sizes and styles. Style options include the elite, italics, proportional, super and sub script, emphasized and double strike prints. The DIP switches make function switching, for example between normal and emphasized characters, fast and simple. There is a choice of two full 96 ASCII character sets with descenders, plus eight international character sets, including American, French, German, Swedish, Danish and Japanese. The large-sized ROM and RAM help to make this machine more efficient, for example all nine kinds of bit image modes are program selectable and can be used in the same line in any combination to produce effective graphics. The RAM can hold up to 256 user-defined characters or else it can be utilised as a 3K print buffer. Fanfold paper or cut sheets can be used in either the friction or tractor feed and can produce up to three copies. The form feed has a programmable length of up to 255 lines. The height of this printer is 150mm and weighs 10 5kg. The Centronics-style 8 bit parallel is the standard interface and optional interfacers include the IEEE 488 and the Serial RS-232C.

Price: £569+Vat
Company: Epson (UK) Ltd
Address: Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH
Tel: 01-902 8892



Facit 4560

A daisy wheel printer capable of 22 characters per second. It has a print wheel which can easily be dropped into place and by using the full character printing method it can print up to 112 different characters in one direction only. It is fairly quiet, operating at about 60 decibels, and is a small machine, 554mm (21.8in.) in height and weighing 19kg (42lbs.). The wheel contains 105 to 112 characters and there is a range of print pitches: 10, 12, 15 and proportional, with the first pitch, 130 characters can be fitted on one line. The ribbon cartridge can fit single strike, multi strike or fabric black ribbon.

Compatible with the Serial: RS 232 C (V.24) interface and has a Baud transmission speed of 300 to 9600. It can print up to six copies using Platen Friction rollers and there are optional paper handling facilities; the Bidirectional Forms Tractor which can print onto continuous paper and the Facit 5060 Cut Sheet Feeder.

Price: £813+Vat
Company: Facit-Addo Ltd
Address: Maidstone Road, Rochester, Kent ME1 3ON
Tel: 0634 401721

NEC Spinwriter 7700 series

Similar to the NEC Spinwriter 2000 series, it can print up to 55 characters per second, bi-directionaly in an optimised print path. For stressing words or phrases, there are various print modes and colours, for instance red and black colours, auto bold, underscored and shadow printing. The choice of 10 or 12 pitch print enables a variable line spacing function. The keyboard can send and receive information from the model 7720 and can do up to 163 print lines. There is a 5 step copy

control and a 8 step impression control with a 256 character buffer (163 on the Centronics I/F). It has the 128 character thimble and can do over 80 different typefaces including Arabic and Technical Maths. It has a 1200 standard (or an 9600 optional) Baud transmission speed and has the Serial RS232 and Parallel Centronics interfaces. This machine is also compatible with the Diablo and Qume. Other features include the proportional spacing function and the ease of maintenance, as it needs a minimum of adjustment and lubrication. Paper handling options available are the single sheet feeder, the twin sheet feeder, a vertical tractor and a bi-directional tractor.

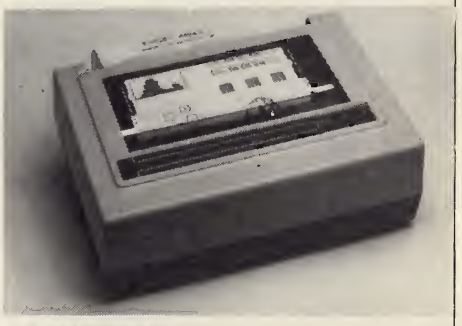
Price: £1,990+Vat
Company: Memec
Address: Thame Park Industrial Estate, Thame, Oxon OX9 3RS
Tel: 084 421 5471

Facit 4542

This uses a heavy duty Flexhammer Print Head which has a long working life and a good print quality. The Head is made up of nine flexible hammers mounted onto a magnet armature, so that it is friction free and needs very little adjusting or lubrication. Also attached, is a Floating Print Head which automatically adjusts the correct paper to print head distance. The Facit 4542 can print up to 250 characters per second and has several printing modes – Bi-directional, uni-directional, grey scale, and scanning (Hammer addressable graphics). For emphasizing and stressing parts of the text, there is a choice of printing modes – upper or lower case, red, elongated, and underlined. There is also the European, USASCII versions and the Greek, Cyrillic and Katakana repertoires making it a very versatile machine. The range can be extended up to 512 characters and with the Variable Size Option the characters can be printed in 95 different sizes from 2.52mm (0.1in.) up to 240mm (6.4in.) and the Bar Code Option allows the printing of a variety of bar codes such as UPC, EAN and various 2 of 5 codes.

There is a semi-graphic character set from which flowcharts and graphical images can easily be constructed. The Scanning Mode can be individually activated via the interface to print curves, diagrams, logotypes, map drawings and pictures. The machine can use the following Parallel interfaces: Basic, Facit SP1, IEEE 488 (IEC) and Centronics and the Serial: CCITTV.24 (RS 232 C) and the programmable Z80 16K. A 766K byte print buffer is used with the option of using a 766+1K byte and a 766+3K byte. A tractor feed can transport the paper at a rate of up to one line per 35 milliseconds and six sheets of paper can be copied at a time. It is 250mm (9.8in.) high and weighs 40kg (86lbs.) and would be suitable for fast printouts of inventory files, stock lists, sales statistics, and invoices.

Price: £2,165+Vat
Company: Facit-Addo Ltd
Address: Maidstone Road, Rochester, Kent ME1 3ON
Tel: 0634 401721



Facit 4544

Based on the 4542 Flexhammer printer, the Facit 4544 is the multicolour version. It has a very high printing speed of 225 characters per second and can combine the printing of high speed text and graphics, it can also print in a variety of modes; text, semigraphics, ten levels of greyscale and pin-graphics. The friction free print head is extremely durable and the prints solid areas at 100% duty cycle. The option exists for variable size characters, Bar Code printing and plotting and it has an extensive repertoire of 128 characters with the option of increasing this to 256 or 512 characters. The colours are provided by a 4-colour ribbon – Yellow, Magenta, Cyan, and Black, where each colour occupies 0.25 inch vertically. The mixing of colours is done by overprinting

or by placing different coloured dots side by side. In the IBM emulating system, a ribbon with the colours Black, Blue, Green and Red is used. An all-Black ribbon is also available.

A 766K memory buffer is inbuilt and the Facit 4544 is compatible with both the Parallel system; Basic, Facit SP1, IEEE488 (IEC), Centronics interfaces and the Serial system; CCITTV.24 (RS 232 C), and the programmable Z80 16K. Paper is transported by a bi-directional tractor feed and a Bottom Feed. The Facit 4544 weighs 40Kg (89 lbs). and is 250mm (9.8in.) high. It seems to be a very versatile colour printer and has potential for a lot of uses, for example when doing curves and diagrams in business graphics, maps, labels, flowcharts, various types of text and colour pictures. Price: £3,500.

Company: Facit-Addo Ltd
Address: Maidstone Road, Rochester, Kent ME1 3ON
Tel: 0634 401721

Anadex DP-9625A

An alphanumeric line printer with the ability to print at three different speeds corresponding to the quality of the print. The highest speed is 200 characters per second and is the data processing quality, the enhanced quality prints at a rate of 100 characters per second and for Correspondence quality the speed is 50-60 characters per second with proportional spacing if required. It is a quiet machine operating at about 55 decibels. The full 96 ASCII sets and the foreign language character sets are available and are printed with lower case descenders and underlining. Features include vertical and horizontal high resolution dot graphics with a linear aspect ratio (72 x 72 dots per inch at 12.5 inches per second and 144 x 144 dots per inch at 6 inches per second), in-line font change capability, OCR, Bar Codes and Font down-loading. The heavy duty print head has 9 wires, with a dot diameter of 0.014 inches and six copies can be produced at a time. Line spacing and line width are variable, selected with a switch or by software.

The Anadex printer can deal with fanfold paper and single sheets. Both the Parallel and the Serial RS232 interfaces are included in the printer, with the 20/60 mA current loop interface available as an option. An audible alarm sounds when the printer runs out of paper, the ASCII Bel code is received, it acknowledges that a front panel switch has been activated, the printer passes the self-test or the carriage jams. The ribbon cartridge has a built in re-inking system and is simple to change. The Buffer expansion can expand the Memory buffer from 3.5K to 5.5K and this option is useful in graphics printing. It weighs 40 lbs. (18kg) and is 8.45 ins. (21.46cm) high.

Price: £1,190
Company: Anadex Ltd
Address: Weaver House
Station Road
Hook
Basingstoke
Hants RG27 9JY
Tel: 025672 3401

Integrex CX80

This is a serial impact dot matrix colour printer capable of printing up to 55 lines per minute. Using one ribbon colour only, it can print 125 characters per second in one direction only. It uses 7 colour codes, each with a separate control command to call up one of the 7 colours available. The ribbon has three lengthwise stripes: green, cyan and yellow from which the 7 print colours are obtained. All data following a colour control code is printed

in that colour until terminated with another colour code. Thus the CX80 may be used as a normal monochrome printer for applications where only two colours plus black are needed, for example for large quantities of text the green-red-black ribbon can increase output. The character ROM contains 96 ASCII and 64 Pet Graphic characters and there are also 15 characters which can be programmed by the user for special applications.

There is a dot addressing function, where by using the control code, the user may address any dot or combination of dots on the line which is up to 7 dots high. Characters and dots may be mixed on a line together with colour changes, elongation and reversal. (The elongated control code will be ignored in dot graphics mode). Paper is moved under programme control and prints on a line space of 6 per inch. Line feed and form feed are both variable, controlled by programming. There is also a test seequence. It is 191mm (7.52in.) high and weighs 9.6kg (21lb.). The standard interface is the Centronics type 8-bit ASCII and optional interfacers compatible include the IEEE 488, the APPLE II, the TRS-80 and the Serial:- RS232C. It has a 75-9600 baud transmission rate and an inbuilt 2K print buffer. Colour printers have a number of advantages, for example they are more visually interesting, improve presentation and make graphics easier to understand. There are numerous applications; Business graphics, histograms, pie charts, graph plotting, viewdata/teletext copy, financial analysis, animation, language teaching and many more. Serial Price: £860+Vat, Parallel Price: £795+Vat and with Commodore Compatible Interface IEEE Price: £845+Vat.

Company: D.N. Computer Services Ltd.
Address: West Croft Industrial Estate, Manchester Old Road, Rhodes, Middleton, Greater Manchester M24 4PJ
Tel: 061-643 0016.

PRINTERS

NEC Spinwriter 2000 series

There are several versions of the NEC spinwriter and each has its own features. This one belongs to the 2000 series and was newly issued in August of 1983. It can do 20 characters per second, bi-directionaly on an optimised print path. The characters can be printed in two colours; red and black, auto bold, underscored or in shadow print and a 10, 12 or 15 pitch print can be chosen. There is a 2K print buffer built into the machine, it has a 9600 Baud transmission speed and the RS232 and Centronics interfaces can be used. It is compatible with Qume and Diablo. The thimbles used in these spinwriters have 128 characters on them and there are 80 type styles available including Technical Maths, Multi-lingual, Arabic, Italic and Graphics. For feeding paper into the printer there is the Auto sheet feeder and a full range of tractors, five copies can be printed at a time. Optional equipment include the single Page guide, a Single sheet feeder, a Twin sheet feeder adaptor, a uni-directional and bi-directional tractor. These printers need a minimum of adjustment and lubrication and are a printer ideal for high quality printing applications.

Price: £1,990+Vat
Company: Memec
Address: Thame Park Road, Thame, Oxon OX9 3XD
Tel: 084 421 4561

MT80

A competitively priced dot matrix printer for users of small business systems and home computers. It prints up to 80 characters per second with an optimised si-directional print. Features included in this model are self test diagnostic procedures, a logic seeking operation for the text and a dot addressable as well as a line graphic printing function. Also included are a variety of print types; 80 column or 132 compressed character print, double height and double width characters suitable for displayed heading, enlarged, emphasised and a super/subscript printing modes. Compatibility with ASCII code, Epson codes and 7 national character sets gives this printer scope for an interesting variety of printing modes.

Several paper transport systems are included including the friction feed, the tractor feed and cut sheet handling, it also has a quick tear facility and can process up to 3 copies. Operating at a noise level of about 55 decibels and weighting 5.3kg (11 lbs) means that this is a quiet and compact machine. Compatibility with most of the popular microcomputers is ensured with the choice of serial or parallel interfaces, for example the Commodore range can be connected with the IEEE interface. Additionally an optional 2K buffered interface is available along with several programmable functions, for instance variable margins and horizontal and vertical tabulation.

Price of 132-column version: £749 + VAT.
With Commodore compatible IEEE interface, price: £799 + VAT.
Price of 80-column version: £285 + VAT.
Company: Mannesmann Tally Ltd
Address: Molly Millars Lane, Wokingham, Berkshire RG11 2QT
Tel: 0734 788711

Facit 4565

This machine has a printing speed of 40 characters per second and can print characters in more than one font using the DIABLO/QUME compatible print wheels. The noise level is 65 decibels which is fairly low and it is 154mm (15.9in) in height and weighs 14kgs (3lb.). In a serial mode, the Facit 4565 can print in one direction only, but with the line mode it can print bi-directionally. Print pitches vary from 10, 12 to proportional and using the control panel, the format and pitch can be selected. The printer uses a Cartridge compatible with Diablo with either a multi strike or fabric black ribbon. The Platen Friction roller can print up to three copies at 4.2 inches per second, and optional

paper handling facilities include the Bi-directional Forms Tractor and the Cut sheet Feeder. It uses the RS-232C (CCITT V.24) interface, has a 300 – 2400 baud transmission speed and uses the standard 2K buffer.

Price: £1,240+Vat
Company: Facit-Addo Ltd
Address: Maidstone Road, Rochester, Kent ME1 3ON
Tel: 0634 401721

Printerlink 22-16

The printer buffer is a very important part of a printer as they speed up the whole process of transferring data from the computer to the printer leaving the computer and disk drives free for other work. Many computers have buffers of up to 16K built into them, but this is often less convenient as pressing the button on the printer has no effect until the buffer is empty. Discom have produced a buffer which has two kilo byte capacities – 16K and 48K, the higher the kilo byte, the quicker the machine is able to process data. It can also store more information in the Ram of the buffer. After the data has been stored in the memory then it liaises with the printer and the computer is free for other uses. Printerlink comes in a casing measuring 5.25 inches long, 5 inches wide, and 1.5 inches deep and is easily installed. Characters are taken from the computer at high speed and passed onto the printer and printed out at whatever speed the printer is capable of. It is Compatible with all computers and printers and is available in Parallel, Serial and IEEE. Price: 16K – £125+Vat and 48K – £165+Vat.

Company: Discom Trading Company
Address: Dresden House, 51 High Street, Evesham, Worcestershire WR11 4DA
Tel: 0386 3591

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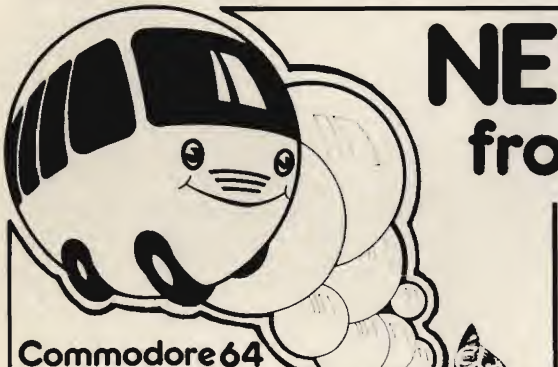

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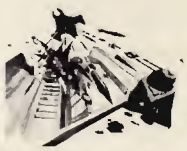

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PRINTERS

Olympia ESW 103 KSR

This can double as an electronic typewriter and as a high quality daisy wheel printer. It maintains a printing speed of up to 17 characters per second in bold, expanded and double strike printing modes. There are a wide variety of daisy type styles available and each wheel has 96 characters. Up to seven copies can be printed, bi-directionaly, with an optimised print path. With the three different print pitches; 10, 12 and 15 (plus proportional spacing), the length of the lines can be respectively 141, 169, and 212 characters long, variable tabulation functions can also be activated. The printhead and platen position, which is addressable in micropitch can be used for X-Y plotting. The Baud transmission rates vary from 50 to 19,200 and there is 4K memory buffer to handle printing tasks. A wide selection of ribbon options are available, for instance carbon film in various colours, and the fabric ribbon cassettes. Inter-faces compatible include the RS 232 (V24), the IEEE and the Centronics data interface.

The related ESW 102 is very similar except that it has been designed for use with the keyboard displays and does not have the same dual capacity. Optional paper handlers include devices to handle single sheets, envelopes, listing paper, and invoice forms. There is a self test ability on both machines and on the ESW 103, there is an automatic full line lift-off correction. The ESW 103 weighs 31.9lbs. and is 6.4 inches high and the ESW 102 is the same height and weighs 28.6 lbs. Price of ESW 103: £1,098+Vat and price of ESW 102: £798+Vat.

Company: Olympia International
Address: Olympia House, 199/205 Old Marylebone Road, LONDON NW1 5QS
Tel: 01-262 6788

Bytewriter

Low cost daisy wheel printer which doubles as a typewriter as well. Capable of printing from 8 to 12 characters per second at a rate of 10, 12 or 15 characters per inch depending on what is desired, as it is switch selectable. The daisy wheels are easily changeable, film or carbon ribbons are used and there is a lift off correction ribbon fitted. Features include automatic underlining, auto repeating and a built in self test program. An important feature of this machine is that it is portable with a carrying case supplied and weighs only 21 pounds including the case. An interface compatible with centronics has been internally fitted and there is an IEEE version available. There are also cables for all the popular computers.

Price: £399+Vat
Company: Discom Trading Company
Address: Dresden House, 51 High Street, Evesham, Worcestershire WR11 4DA
Tel: 0386 3591

Toshiba TH2100H

A dual mode printer which can print with a letter and word processing quality at a rate of 100 characters per second and also in a speedier dot matrix type at a rate of 196 characters per second. Also featured are proportional spacing, dot addressable graphics with 21,600 dots per square inch, 31 standard graphics characters and a 256 character buffer. A cartridge ribbon is used in this printer. Two word processing fonts; the Prestige Elite and the Toshiba can be selected by software and a 10 or 12 pitch print can be selected to give a variable line spacing. It can print on paper up to 15 inches in width and can do five copies at a time, there are also the optional paper handling facilities; The Auto sheet and

Tractor Feeds available. A very useful combination printer.

Price: £1,550+Vat
Company: Memec
Address: Thame Park Industrial Estate, Thame, Oxon OX9 3RS
Tel: 084 421 5471

Brother HR15

A reasonably priced daisy wheel printer able to print at the comparatively slow rate of 13 characters per second. The wheel has 96 characters and this and the ribbon cartridge are both easy to change. For emphasising or stressing words and phrases, the two printing colours; red and black, the auto bold and underlining functions can be used. Also featured are graphic characters and proportional spacing. There is a 2048 character buffer and a stepper motor drive. An optional keyboard is available and for paper feeding, the optional Tractor and Auto Feeders can be used capable of taking paper up to a width of 13.5 inches. The RS232 Serial and Centronics Parallel interfaces are both compatible and the printer can be used with the Diablo code.

Price: £540+Vat
Company: Thame Park Industrial Estate, Thame, Oxon OX9 3RS
Tel: 084 421 5471

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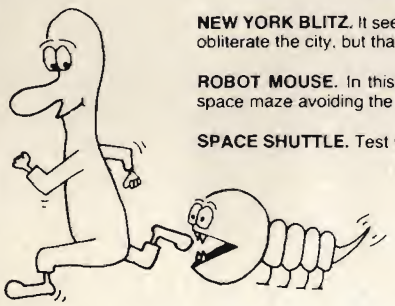

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VISA

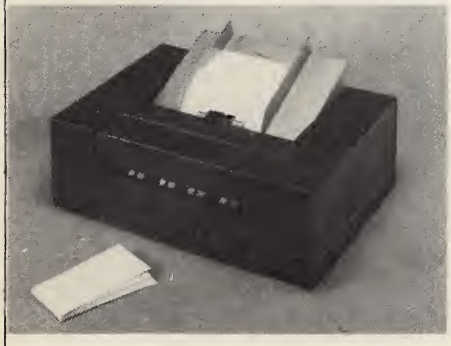
small systems engineering limited

2-4 Canfield Place, London NW6 3BT. Telephone: 328 7145 Telex 264538

Type 4400

The Type 4400 is a revolutionary British printer using a unique thermal transfer process. Part of a future family of products, it is designed mainly for printing addresses onto envelopes and wrappers and so the line length is limited to 4 inches, a more conventional 80 column version is in the pipeline. The printing process is carried out using a static thermal print head which activates a heat sensitive ribbon and as there are no moving parts the process is totally silent. The normal print speed is 520 characters per second and envelopes can be addressed at a rate of 3000 per hour. A standard choice of 12 sizes of character is available as well as three character sizes in both 5 x 7 and 7 x 9 matrices plus a double height version of each.

The thermally activated ribbon comes in a standard black colour, but other colours can be ordered. Each ribbon has the capacity to print 15-20,000 addresses and as they are only activated at temperatures above 70 degrees centigrade they remain clean if handled. The machine is built to last, is brown and gold in colour and is 8.5 in (212mm) high and weighs 66lbs (30kg) making it suitable for any normal office environment although it is not really suitable for use with home computers. Features include a powerful stepper motor drive, ribbon-out and paper-out detectors and an automatic conversion to upper case. A RS 232 Serial input is the standard interface although an optional Parallel interface is available.



Typical applications include printing addresses onto envelopes or wrappers without use of labels, Bar codes on packaging, headings on clock cards and the ability to print on pvc and other plastic materials broadens its scope. There are three paper exits, providing versatility and adapting it for a wide variety of applications. For instance the paper can emerge printed side up into a tray or an optional stacking conveyor, it can be directed through a slot in machine base into the tray or envelopes or it can be delivered directly into the feeder of a folder-inserter ready to receive the relevant envelopes' contents. Optional facilities are the Machine stand and the Extended paper feed and stacking unit for large volume users. Price: £2475 + VAT and TX3 Transfer ribbon price: £38 + VAT

Company:	*Thermal Transfer Technology*
Address:	*Datarite House* *44 Grafton Road* *New Malden* *Surrey*
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Aptec RP1300

A daisy wheel printer capable of printing 37 characters per second, bi-directionally along an optimised print path. The dual plastic print wheel has the full 96 ASCII set plus an additional 28 special characters and is compatible with Ricoh and Radio Shack, so wheels will be easily obtainable. The print pitch varies from 10, 12 to 15 characters per inch and print enhancements include red and black colours, bold face, underlining, left and right justification and proportional spacing. Software is not needed for operating the printer, as an initialisation with a few code sequences will suffice to produce a presentation quality text. The print format capabilities are fairly versatile; form length can be controlled to any length, tabulation can be horizontal or vertical, horizontal spacing varies from 136 characters per line at the 10 pitch and 163 characters per line at the 12 pitch. Charts, diagrams and pictures can be produced with the graphics function.

Compatibility with Qume, Diablo and Spinwriter is provided, but perhaps one of the main achievements of the APTEC Flowriter is its compatibility with a wide range of software and hardware. For instance it can be run with the following Wordprocessors; Applewriter, Magic Print, Wangwriter and Wordcraft, with the following Applications packages and Operating Systems; BOS, CP/M, Peachtree, Silicon Office and Visicalc and with the following Microcomputers; BBC Micro, Epson QX10, CBM Pet, Olivetti, and the Victor 9000. It uses the Serial RS 232 C (V.24) and IEEE-488 and the parallel Centronics interfaces. The buffer is the standard 8K buffer with an optional 2K byte available. Accessories include the Tractor feed, auto page feeder with which seven copies can be produced at a time plus an acoustic cover. Also in this range is the APTEC RP1600 which has a faster print rate of 60 characters per second. Price of RP1300: £1,245 + VAT and Price of RP1600: £1,635 + VAT.

Company:	*Appropriate Technology Ltd.*
Address:	*2-4 Canfield Place* *London NW6 3BT*
Telephone:	*01-328 7272*

Interface Systems have a range of interfaces, all of which come complete with the necessary cables, a separate mains adaptor and a handbook. The interfaces currently available are Centronics to Centronics, RS232 to RS232 and IEEE to IEEE. In each case, the interface buffers can accept characters at a rate in excess of 10,000 characters per second storing them for transmission to the printer as and when the information is needed. The storage in each case is 16K to 48K although there is an extended version to 96K.

Centronics

The input interface comprises the data strobe, 8 bit data with busy and acknowledge signals. The output is the same of course except that the output does not have the acknowledge signal. The options are 36 way cables and high drive output components.

RS232

The RS232 is asynchronous with a panel switch selectable baud rate of 600, 1200, 2400 and 9600. The character length is 8 bit standard with a 7 bit link option. There

are also options with regard to parity and stop bits. There is either no parity, standard even and odd link options and with regard to the stop bits there is a 2 link option.

IEEE

This interface has a primary address of input 04 and output 04 with all secondary addresses being passed on to the printer. The IEEE is compatible with all Commodore 2000, 4000 and 8000 series computers and peripherals.

Other models to be announced are the full duplex RS232, IEEE to Centronics, IEEE to RS232, RS232 to Centronics and Centronics to RS232. All 16K versions cost £125.56 and the 48K versions cost £158. All prices exclude VAT and packaging.

Company: *Interface Systems*
Address: *Trenton House*
16 Eversley Road
Bexhill-on-sea
East Sussex TN40 1HA
Telephone: *0424 225656*

Oxford Computer Systems are the producers of an ingenious interface called Interpod, designed to enhance the effectiveness of the 64 in the business world and to alleviate the problems encountered by the owners of the 4000 and 8000 series who wanted to supplement their system with the 64 but could not do so because printers and disk drives were not accessible.

Interpod is an ingenious multiple interface that houses both RS232 and IEEE while remaining completely transparent to both the 64 and the software. It does not use the 64's cartridge slot so the Commodore's internal memory is not compromised. Oxford Computer Systems say it is completely compatible with the available software. Price: £125 + VAT

Company: *Oxford Computer Systems Limited*
Address: *Hensington Road, Woodstock, Oxford*
Telephone: *0993 812 700*

Small Systems Engineering Limited supply the C100, A100, B300 and GPI 1000 interfaces.

C100

This is an IEEE 488/RS232 interface that enables standard serial devices such as printers, visual display units and teletypes to be driven from the IEEE bus by controllers such as the PET. Baud rates from 100 to 9600 is internally switch selectable and serial output is in the form of RS232 signals and a cable with standard D-type connector. An RS232 handshake line is provided and a current loop adaptor is available. Price £120.

A100

This is an IEEE 488 Centronics/Anadex interface which enables standard parallel devices to be driven from the IEEE bus by controllers like the PET. Along with a no code conversion mode, there is also a switchable code conversion facility to match text printout to either upper or lower case PET display or upper case to graphics.

Both the interfaces are supplied with a suite of short BASIC programmes to illustrate the capabilities and modes of operation in different configurations. Price £106.

B300

This interface is an IEEE 488 which replaces the SSE type B and the B200. Bidirectional, it is fully compatible with both of these earlier units in that it incorporates both software selectable and switch selectable baud rate control, of which there are 16 rates in the range of 50 to 19,200.

There are two possible connectors, these being the IEEE which is a 24 way male connector and the RS232 which is a 25 way D-type connector. The options include a current loop adaptor and a communications PROM. Price £186.

GP1 100

This IEEE to RS232 interface is based around the Z80 microprocessor and is capable of buffering up to 59K bytes of input data. The software selectable options are parity, stop bits, data bits, data input mode, code conversion, XON/XOFF and separate I/O baud rates.

The GPI comes as standard with PET type IEEE 488 port edge connector and a female 25 way D-type socket. However, the IEEE 488 cable with stacking connector, the GPI IEEE 488 port to stacking connector, the RS232 terminal cable and the RS232 modem cable are all separate items.

The price for the 1K byte buffer is £275 and this basic price increases by £15 per 1K increment so that the 59K buffer costs £575. Prices do not include VAT or delivery.

Company: *Small Systems Engineering Limited*
Address: *2/4 Canfield Place, London NW6 3BT*
Telephone: *01-328 7145*

Timtom micro have got an interface to connect the typewriter to the computer. The computer they have in mind is the VIC 20 but the unit could be applied to any other machine which has an RS232C port operating at 300 baud.

The typewriter the manufacturers intended to be connected to the computer is the Olivetti Praxis 30 or 35 daisywheel and to this end the interface features a processor which allows users to print the complete Praxis character set. The cost of connecting your micro to a Praxis using this interface is £69.

Company: *Timtom Micro*
Address: *9 Ilton Road*
Penylan
Cardiff CF2 5DU

INTERFACES

DAMS have produced a IEEE 488 interface for both the VIC and 64 which means that all the peripherals previously associated with the PET can now be applied to the VIC. Up to 15 VIC and 64 computers can be connected to one central disk drive. The IEEE automatically reconfigures the VIC and 64 to input/output use allowing simultaneous use of the VIC and 64 serial bus. The interface uses the standard PET/IEEE cable and plugs directly into the VIC/64 memory expansion port.

The 64 version contains all of the benefits associated with the VIC 20, but it also has an automatically relocating code to allow plug-in cartridge programs and a reproduction of the 64's memory expansion slot to allow you to use ROM based business software. The cartridge comes with a full 12 months guarantee for £49.95 plus VAT.

Company: *DAMS Office Equipment Limited*
Address: *Gores Road*
Kirkby Industrial Estate
Kirkby near Liverpool
L33 7UA
Telephone: *051 5487111*

Probably more famous for their involvement in the decorating industry, Imperial Chemical Industries have entered into the interface market with Rexagan, Junior Rexagan and Super Rexagan.

Junior

This interface is aimed at the educational market to teach microcomputer interfacing techniques at all levels, or it could be used as a versatile tool for data acquisition and control of experiments in the science or engineering laboratory.

Junior is a single board interface for the PET series with a one channel 8 bit analogue input and output. Along with the interface comes a software tape which demonstrates the four basic interfacing functions.

Rexagan

Rexagan will link up to the PET and the VIC and has either an 8 or 12 bit analogue input and output. Because eight signal boards can be slotted in to the master unit at any one time the Rexagan can do several jobs at once. Along with the analogue input and output and the digital input and output, there is also a pulse counter which can be used as a clock and a watchdog which can either ring a bell, cut off the power or activate alternative mechanisms if something goes wrong with the computer or the interface.

Super Rexagan

This is an advanced computer interface which allows control of complex laboratory and engineering systems. It can be used with all popular computers and the master unit can accommodate up to 10 signal modules. There is a frequency input that counts how many times a signal is received and a watchdog similar to the Rexagan.

Two packages are available as plug-in cartridges, these being Tomult and Simons Tomult Basic.

Company: *ICI*
UK distributor: *Dyson Instruments Limited*
Address: *Sunderland House*
Statin Road, Hetton
Houghton-le-Spring
Tyne & Wear DH5 0AT
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MOREPOWER contains many fancy disk commands such as:-
DEVICE: DISC: ERR: LIST: MERGE: RUN: LOAD: START: SIZE: TEXT: UNDO: HEX: KEY:
The built-in function keys on the 64 are given special definitions when used with **MOREPOWER.** f2 gives a disk directory, f4 prints the disk error channel and f8 prints the LOAD keyword and the return. The f6 key puts on AUTO mode after reading the bottom line number of the screen.

PAL

PAL stands for Personal Assembly Language. It is a program that takes a program written in symbolic format and converts it to machine code that the 6500 microprocessor in the Commodore 64 or 8000 can execute.
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Driving An Oscilloscope From The User Port

This month we have two articles on using the Commodore User-port as an output port. The first of these articles is about high resolution displays to an oscilloscope. The displays are of waveform or spectrum types with approximately 3000 points plottable. This article is of most interest to universities or colleges for teaching purposes.

Written by Dr. Alan T. Collins, a Physics lecturer at Kings College, London.

The second article is a continuation from last month's article about connecting VIC, 64, PET via the user port, by Owen Murcott B.Sc. MBCS

The hardware and software described in this article allow a spectrum or waveform stored in a Commodore computer to be displayed on an oscilloscope. More than 3000 points can be displayed along the horizontal axis, with a vertical resolution of 256, before flickering of the trace becomes objectionable.

The interface can be built for less than £10.

Overview

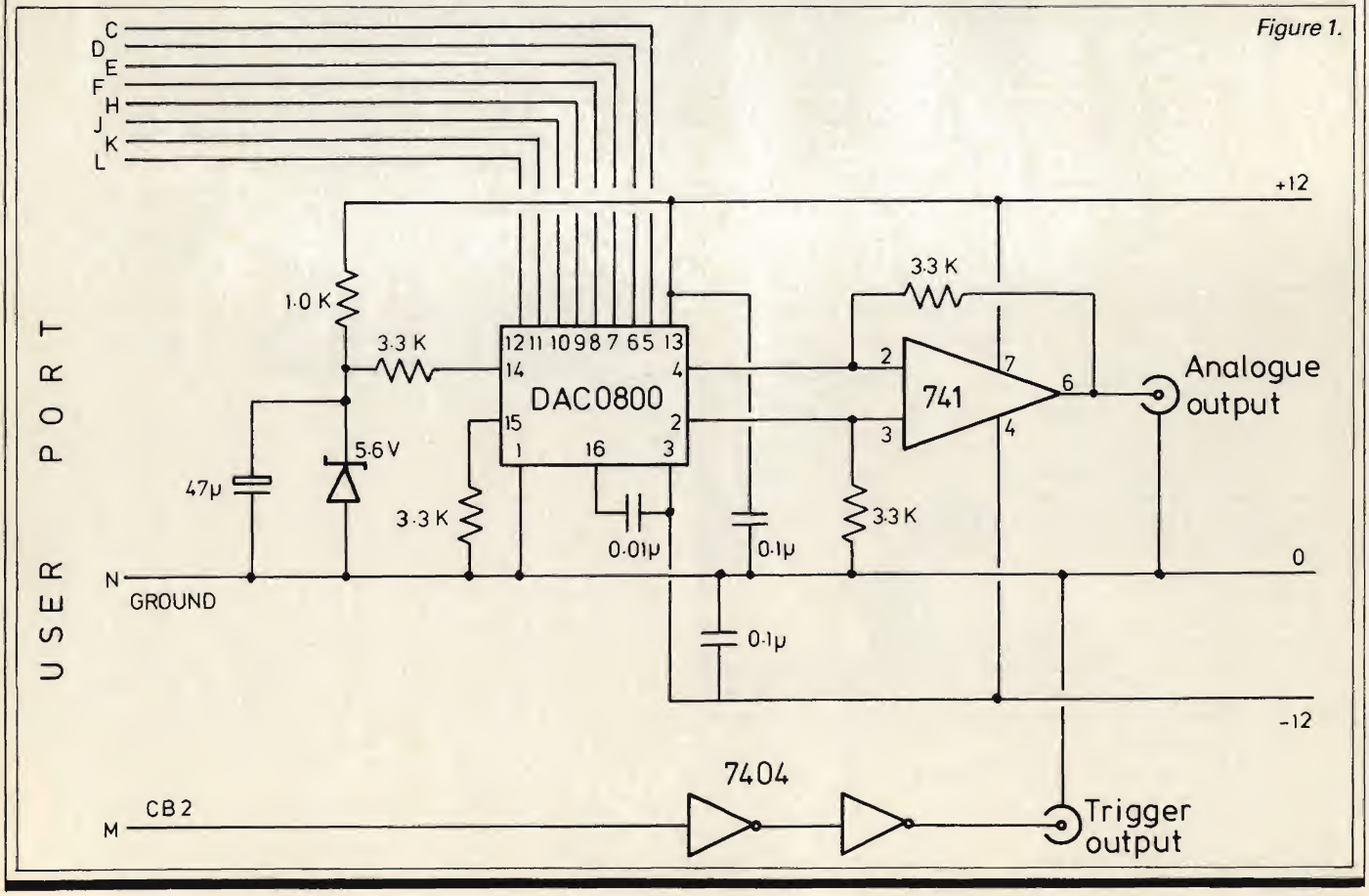
All Commodore computers are fitted with a parallel user port which can be employed to input and output information. The important connections are the 8 data lines, connected internally to port A of a Versatile Interface Adaptor (VIA) and the two "handshake" lines connected to CA1 and CB2 on the VIA. In the application described in this article the 8 data lines are configured as outputs, and the digital information is converted to an analogue signal using an 8-bit digital to analogue converter (DAC). The waveform stored in the computer is repetitively output to the DAC and the analogue signal is displayed on an oscilloscope. At the beginning of the waveform CB2 is pulsed high to synchronize the oscilloscope, which is operated in the externally-triggered mode. A stable trace is obtained by carrying out the interrupt servicing routine for the computer during the flyback period of the oscilloscope time base. To simplify the software (and thereby maximise the data transfer rate) the number of data points displayed must be a multiple of 256. More than 3000 points can be output to the oscilloscope before the flicker on the trace becomes significant, and waveforms and spectra can therefore be displayed with very high resolution along the horizontal axis.

The software has been written for the Commodore 2000/3000 series computer, and will run with one change on the 4000 and 8000 series. Slightly more extensive modification should allow operation on the VIC20, Commodore 64 and 700 range of computers.

Hardware

A circuit diagram of the hardware is shown in figure 1. Virtually any 8-bit DAC can be used and the DAC 0800 has the advantage of being very cheap. The complementary outputs are taken to a 741 operational amplifier, and with a 5.6 volt zener diode used as a reference for the DAC and the output from the op-amp varies from −5.6 to +5.6 volts for digital

Figure 1.



codes between 0 and 255. If it is envisaged that waveforms with rapid rise and fall times will need to be displayed, an op-amp such as the 741S with a high slew-rate should be used. Otherwise the limited slew-rate of the standard 741 is advantageous in that the very fast glitches (switching transients) from the DAC are filtered out, giving a cleaner looking tace.

Although not essential, it is prudent to buffer the CB2 line and this is simply done using two gates of a 7404 hex inverting buffer in series. The output from this buffer drives the external trigger of the oscilloscope.

Power supplies are not shown in figure 1; the op-amp and DAC require typically +/−12 to +/−15 volts and the 7404 requires +5 volts. Excluding power supplies, the total cost of the components shown in figure 1 is less than £4. When allowance is made for a user-port edge-connector, BNC connectors for the oscilloscope and a small piece of circuit board an overall cost of about £10 is obtained.

BASIC Program

The BASIC program shown outlines the bare essentials. It is imperative that A% and B% are the first and second variables declared. A pointer to the start of variables is contained in the zero-page memory locations 42 and 43; the machine code program picks up the low byte of the variables using LDA(42),Y with Y=3 for A% and Y=10 for B%. I have assumed that a computer 32K of RAM is being used, and that the top 4K is "protected" from BASIC by lowering the top of BASIC pointer. (Immediately after switching the computer on, PEEK(53) is normally 128).

The data to be displayed on the oscilloscope may be an experimentally measured spectrum or waveform that has been input to the computer, used on-line as a data logger, or it may be the result of a purely theoretical calculation. Whatever the origin of the data, it must be scaled to lie in the range 0 to 255 and then POKE'd into the protected area of RAM.

The data forming the oscilloscope display will start and finish on a page boundary. The number of pages to be output (A%) will normally be in the range 1 to 12, and the start page (B%) will be in the range 112 to 127 in the example shown.

The user will obviously modify the program shown to suit his own particular needs. For example, the top 8K of memory might be protected, and 4 different waveforms each 2K long written here to provide 4 alternative displays.

```
100 A%=0:B%=0
110 POKE53,112:REM      PROTECT TOP 4K OF RAM
115 REM
116 REM
120 REM      USER'S PROGRAM GOES HERE TO CALCULATE AND POKE
130 REM      DATA INTO PROTECTED RAM AREA
135 REM
136 REM
500 INPUT"NUMBER OF PAGES";A%
510 INPUT"START PAGE";B%
520 SYS826
530 GOTO500
```

Once the data have been set up in RAM, a SYS call is made to the machine code program, shown here located in the second cassette buffer (starting at memory location 826).

Machine Code Program

The machine code program is shown as an assembly listing with a start address of 826 ($033A), but it can be loaded into any convenient memory location. Three of the VIA registers are important. The data direction register for port A (DDRA) at 59459 ($E843), the peripheral control register (PCR) at 59468 ($E84C), and the output register A (ORA) at 59471 ($E84F). Note that port A has two different registers; writing to $E84F does NOT produce a handshake on CA2, a VIA line that is connected internally. Loading DDRA with 255 configures all the data lines as outputs; loading with 0 sets the lines as inputs. The PCR normally contains either 12 or 14 depending on which character set is in use. If additionally bits 7 and 6 are set to 1 and bit 5 is set to zero the CB2 is driven low; if bits 7, 6, and 5 are all set to 1, CB2 is driven high.

The floating point accumulator is zero page memory 94 to 99 ($5E to $63) is used in the program as a "scratch pad". The initialisation (lines 4 to 19); save the current PCR contents, set CB2 low, loads 98 with the first page number, 95 with the final page number and 96 with zero. (In LOOP2, 96 and 97 form a two-byte pointer).

The central part of the program is responsible for scanning through the block of data and outputting the bytes to ORA. At the beginning of every scan the machine code branches to START. For the whole duration of the scan, hardware interrupts are disabled. At START the interrupt disable flag is cleared and if a hardware interrupt has occurred the system immediately jumps to the interrupt servicing routine, then returns. The interrupt servicing routine includes a keyboard scan and if a key has been depressed, memory location will be non-zero. After looking at the "keyboard queue" the interrupts are again disabled. If no key has been pressed the program branches to LOOP1; otherwise provision is made for testing 4 keys: L which shifts the display left, R which shifts the display right, B which returns to BASIC and STOP which returns to BASIC and stops. Note that the JSR address in line 24 is for BASIC 2; for BASIC 4 $E285 should be replaced by $E087 for 40-column machines or $E0A7 for 80-column versions.

Left shift and right shift are obtained by incrementing or decrementing memory locations 98 and 95 which contain the first and last page numbers respectively. Before returning to BASIC (at OFF) port A is configured for input, the PCR is loaded with its original contents and the interrupts are enabled.

In LOOP1 the high byte of the pointer is reset to the start page, register X is loaded with the final page number and then a delay loop is encountered. It is important to realise that the sequence of events from START, including servicing an interrupt if one has occurred, take place during the flyback period of the oscilloscope time base. Even so, some additional delay is often necessary before the time base has settled and is ready to be re-triggered. The code in lines 36 to 39 creates a delay of approximately 350 micro seconds. Following this delay Y is set to zero, CB2 is pulsed high then low to trigger the oscilloscope and the program enters LOOP2.

In LOOP2 the LDA(96),Y followed by STA $E84F picks up the data from the address pointed to in 96 and 97, indexed by Y, and writes it to port A of the VIA. By incrementing Y, and incrementing 97 each time Y wraps around, the bytes can be output very quickly (3338 micro seconds for 256 bytes). When the byte in 97 is the same as that in register X (i.e. the last page number) the program branches to START.

As mentioned earlier, although the assembly listing is for a load address of 826 ($033A) the program will run anywhere in memory. Readers who do not have an assembler can write a simple BASIC program to POKE the hex bytes listed in the "code" column into the chosen memory location.

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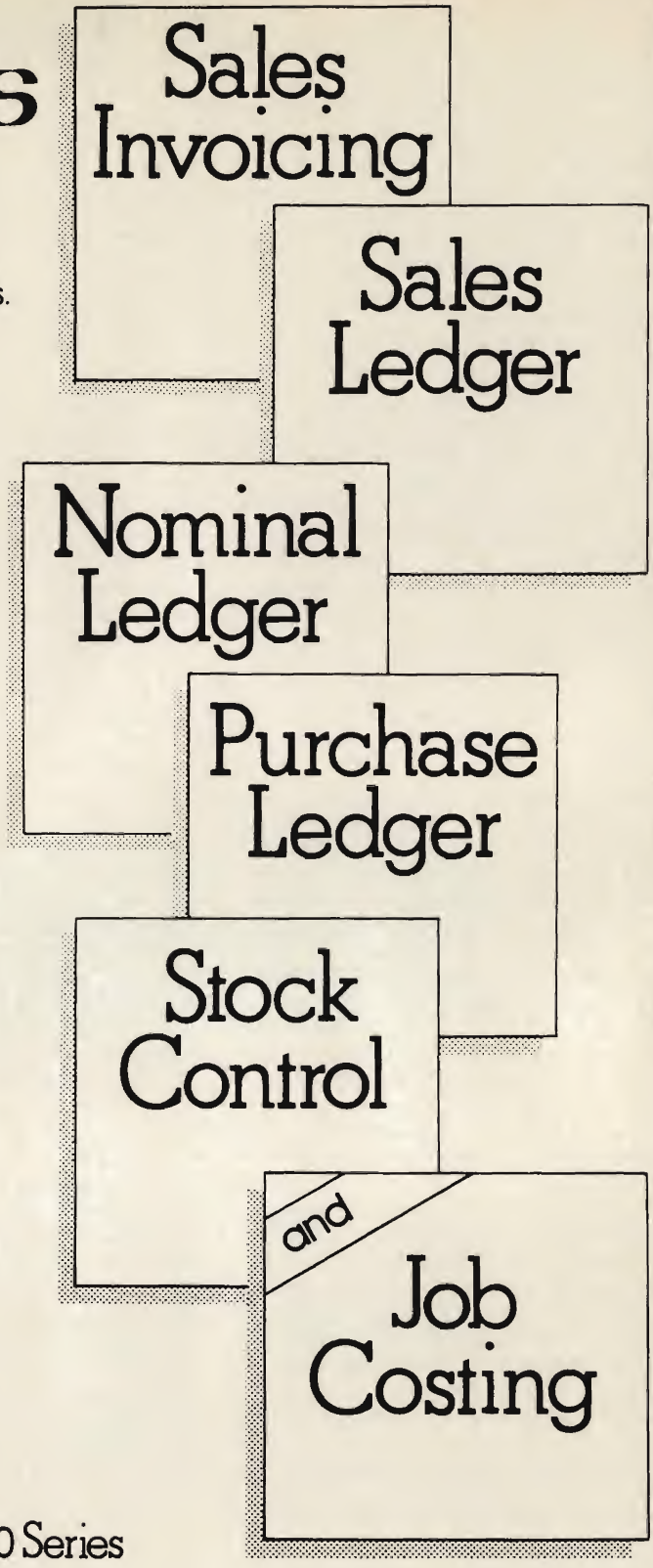

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Performance

If a test waveform with 2048 points (i.e. 8 pages) is written into the protected memory area and a SYS call made to the machine code using the BASIC program shown earlier, a trace should appear on the oscilloscope by adjusting the trigger level control. The Y sensitivity should be set to about 1.5 volts/cm and the time base to about 2ms/cm for a typical 8 x 10 cm screen. By adjusting the variable control on the time base the waveform can be fitted exactly on to the screen. Just before or just after the time base setting at which the trace fills the screen the display will start to flicker. This is because the sweep time is too long, and every other trigger pulse is being missed. If it is not possible to display the entire waveform before flickering starts, the number 50 in line 36 of the machine code program should be made larger so that the flyback delay is increased.

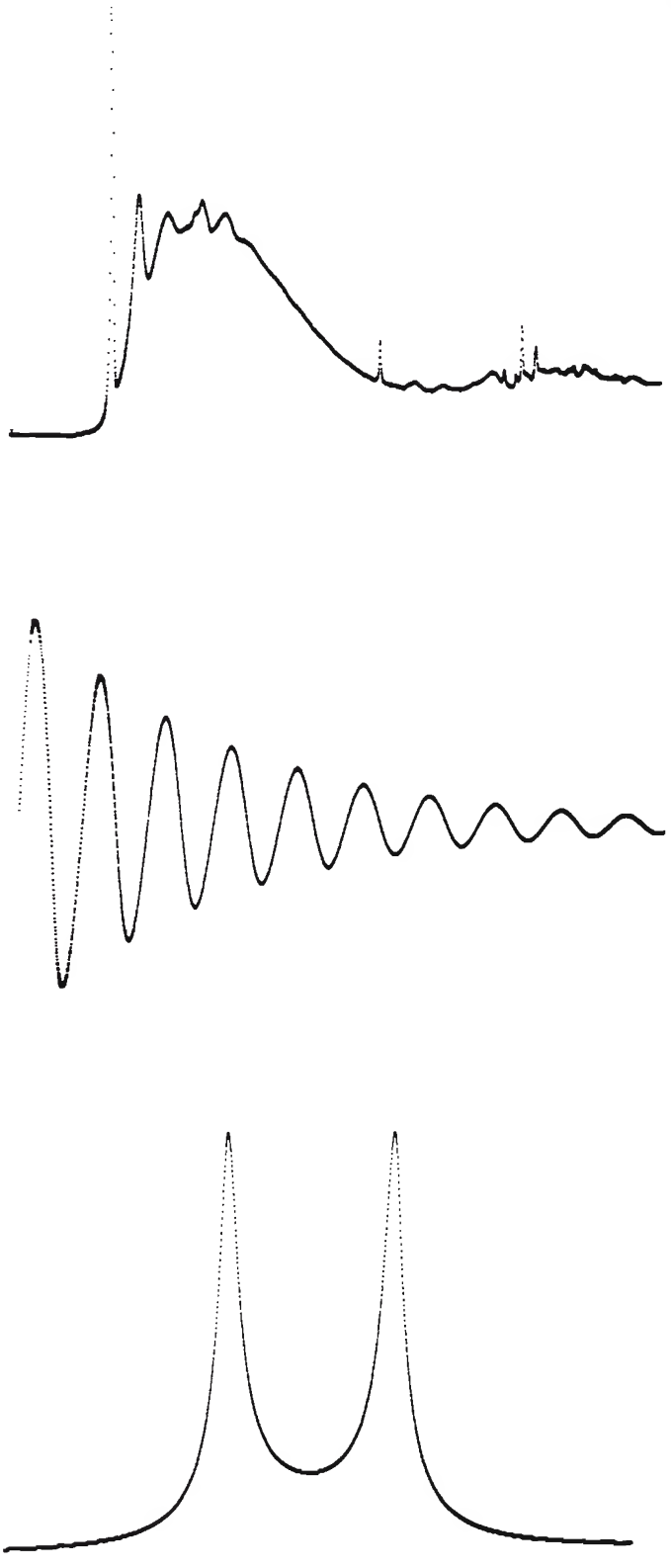
In practice the correct time base setting will depend on how many pages of data are displayed. Typical traces obtained by the author are shown in figure 2. The top diagram is an experimental spectrum of 2560 data points stored in the computer using a data-logging system, and represents luminescence intensity (vertical axis) plotted against wavelength (horizontal axis). The middle diagram is a calculated waveform for damped simple-harmonic motion and is plotted as amplitude versus time. The bottom diagram is the theoretical frequency response of two identical coupled resonant (LCR) circuits and is shown as current in the secondary winding plotted against frequency. The middle and lower diagrams both have 1792 points displayed.

The photographic exposure time used for figure 2 was long compared with the time base scan; the sharpness of the photograph indicates that there is complete freedom from jitter on successive scans.

The high resolution display obtained using the hardware and software described in this article provides a valuable aid for both teaching and research. Some theoretical may take a long time to calculate and for teaching purposes such waveforms could be stored on disk. If a utility ROM such as BOS is available, a 3000 point waveform can be loaded from disk into RAM in about 2 seconds, and more than 50 such waveforms stored on one disk. (The BOS ROM is available from Rhombus Products, 87 Bourne Way, Hayes, Kent).

Finally, I must say how grateful I am to Terry Jeffries for building the circuit shown in figure 1 and to Pam Jones for photographing the waveforms.

Figure 2.



Machine Code Program

```
LINE# LOC   CODE          LINE

0001  0000                      * = 826
0002  033A                DDRA  = $E843
0003  033A                PCR   = $E84C
0004  033A  AD 4C E8            LDA PCR
0005  033D  85 5E               STA 94          ; SAVE PCR
0006  033F  09 C0               ORA #192
0007  0341  8D 4C E8            STA PCR         ; CB2 LOW
0008  0344  A9 FF               LDA #255
0009  0346  8D 43 E8            STA DDRA        ; PORT A AS OUTPUT
0010  0349  A0 0A               LDY #10
0011  034B  B1 2A               LDA (42),Y      ; LO BYTE OF B%
0012  034D  85 62               STA 98          ; FIRST PAGE NUMBER
0013  034F  A0 03               LDY #3
0014  0351  B1 2A               LDA (42),Y      ; LO BYTE OF A%
0015  0353  18                  CLC
0016  0354  65 62               ADC 98
0017  0356  85 5F               STA 95          ; FINAL PAGE NUMBER
0018  0358  A9 00               LDA #0
0019  035A  85 60               STA 96          ; LO BYTE OF POINTER
0020  035C  58                START CLI         ; ENABLE INTERRUPTS
0021  035D  A5 9E               LDA 158         ; KEYBOARD QUEUE
0022  035F  78                  SEI             ; DISABLE INTERRUPTS
0023  0360  F0 13               BEQ LOOP1
0024  0362  20 85 E2            JSR $E285       ; GET A CHARACTER
0025  0365  C9 4C               CMP #76         ; IS IT L ?
0026  0367  F0 44               BEQ LEFT
0027  0369  C9 52               CMP #82         ; IS IT R ?
0028  036B  F0 47               BEQ RIGHT
0029  036D  C9 42               CMP #66         ; IS IT B ?
0030  036F  F0 30               BEQ OFF
0031  0371  C9 03               CMP #3          ; IS IT STOP ?
0032  0373  F0 2C               BEQ OFF
0033  0375  A5 62          LOOP1 LDA 98
0034  0377  85 61               STA 97          ; HI BYTE OF POINTER
0035  0379  A6 5F               LDX 95          ; FINAL PAGE NUMBER IN X
0036  037B  A9 32               LDA #50
0037  037D  85 63               STA 99
0038  037F  C6 63          DELAY DEC 99         ; FLYBACK DELAY
0039  0381  D0 FC               BNE DELAY
0040  0383  A0 00               LDY #0
0041  0385  A5 5E               LDA 94
0042  0387  09 E0               ORA #224
0043  0389  8D 4C E8            STA PCR         ; CB2 HIGH
0044  038C  49 20               EOR #32
0045  038E  8D 4C E8            STA PCR         ; CB2 LOW
0046  0391  B1 60          LOOP2 LDA (96),Y
0047  0393  8D 4F E8            STA $E84F       ; (ORA, NO HANDSHAKE)
0048  0396  C8                  INY
0049  0397  D0 F8               BNE LOOP2
0050  0399  E6 61               INC 97          ; INC HI BYTE WHEN Y WRAPS AROUND
0051  039B  E4 61               CPX 97          ; CHECK IF FINISHED
0052  039D  D0 F2               BNE LOOP2
0053  039F  F0 BB               BEQ START
0054  03A1  A9 00          OFF  LDA #0
0055  03A3  8D 43 E8            STA DDRA        ; PORT A AS INPUT
0056  03A6  A5 5E               LDA 94
0057  03A8  8D 4C E8            STA PCR         ; RESTORE ORIGINAL PCR
0058  03AB  58                  CLI             ; ENABLE INTERRUPTS
0059  03AC  60                  RTS
0060  03AD  E6 62          LEFT  INC 98
0061  03AF  E6 5F               INC 95
0062  03B1  18                  CLC
0063  03B2  90 C1               BCC LOOP1       ; BRANCH ALWAYS
0064  03B4  C6 62          RIGHT DEC 98
0065  03B6  C6 5F               DEC 95
0066  03B8  18                  CLC
0067  03B9  90 BA               BCC LOOP1       ; BRANCH ALWAYS
0068  03BB                      .END
```

Connecting CBM/PET/VIC/64 Through The User Port

This is the second in a series of DIY articles by Owen Murcott about how to connect two Commodore computers through their user ports. Owen takes you step by step through the registers, using a sample program to explain their use. It is not as technical as it looks at first sight, although there are a few technical words. But he explains them quite simply, with some occasional 'asides' on related topics.

Making them talk

Last month I described how to make a connector to link any two Commodore machines, except the latest 8000 and 700 series. These need special connectors. But in all cases, the way you make two machines communicate is the same. They each have an interface chip with a number of registers with control the user port. The register addresses are not the same in all machines, and the machines do not all have the same chip. But wherever I use the name "PET", I include all other CBM machines which use the 6522 Versatile Interface Adapter (VIA) for controlling the user port, except the VIC as its addresses are different. The Commodore 64 has a 6526 Complex Interface Adapter (CIA) instead. Incidentally, a number of other machines (including the BBC Microcomputer and Sirius) also use the 6522 chip for their user port; that opens up a lot of possibilities for inter-connected machines!

In each case, your program has to put numbers, using POKE commands, in to certain registers in the chip. This article only covers the registers used for the communication; it is not intended as an exhaustive (and exhausting) survey of the chips and how they work. Look in "PET Revealed" or "VIC Revealed" for that.

Fig 1 shows the overall arrangement of two computers connected through their user ports. Fig 2 names the registers to be peeked and poked to control the communications between them. This month I shall explain the terminology of these diagrams, and will tell you what to poke and where. Once you know what to do, you can make interactive two-machine games, and can share peripherals between two machines.

Keyboard connector program

You might use the example program from the end of this article to connect a 64 to a PET, for example, and input data to the PET from the 64 keyboard.

The 64 gets characters one at a time from its keyboard. It sends them to the PET which treats them as though they had been keyed in to it directly. The program will also work with all other combinations of machine. However, you will need to remove some of the REM statements to get it in to an un-expanded VIC.

This heavily-annotated program is really just a skeleton to show the use of the registers. It does no more than print the key-presses on the second screen. The main intent is to show you the procedures in action and to provide an example for you to refer to. You could, of course, use the key-presses for any purpose.

Rather than having three versions of the program, it seemed sensible to provide one which identifies the machine in which it resides (lines 60-62). The program then selects and reads the appropriate register addresses and values (lines 70-85) from DATA statements (lines 30-51). This approach makes programs more flexible, at the expense of being slightly longer. If you wish to extend the approach to differentiate between different models of PET, the values of the variable MT would be:

* BASIC 1	0
* BASIC 2	58907
* BASIC 4	58434

When you run the system, start the transmitter program first. If you don't, it will wait for ever to get the receiver's first 'ready' signal, which will already have been sent.

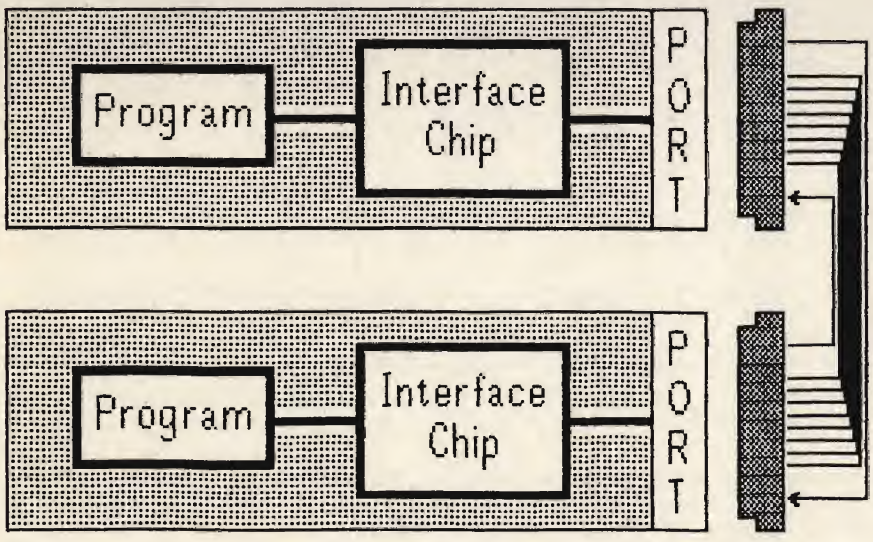


Fig 1 – Connected computers

(Fig 2 – Interface Chip Controls)

The Data Register

There are two possible styles of transmission:

* Serial	Data is sent a bit at a time, one after the other;
* Parallel	Data is sent eight bits (a byte) at a time, in parallel, and therefore much faster.

The connector described last month is wired for parallel transmission. Eight of its wires connect user port contacts to the corresponding contacts in the other machines. They carry the data signals. For this reason, the port is sometimes described as the "Parallel User Port".

One of the interface chip's registers, called a Data Register (DR for short), is connected to the user port's eight data contacts. To transmit data, your program has to poke bytes one at a time to the Data Register (line 230). To receive data it

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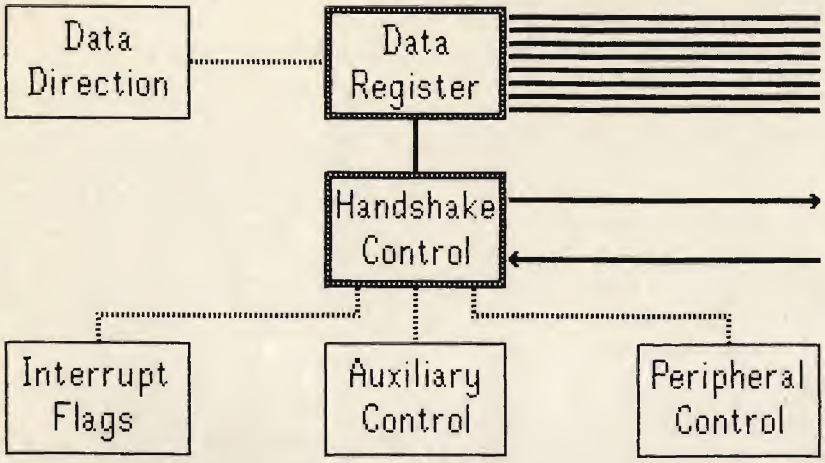

Fig 2 – Interface Chip Controls

will peek at the Data Register (line 320). The same register is used for both transmitting and receiving. Here are its addresses:

* PET	59457
* VIC	37136
* 64	56577

Data direction

Before you can use the Data Register, you have to program the interface chip either to receive or to transmit. If you don't, incoming data may be ignored or outgoing data may not be sent. Do it early in your program before you start peeking or poking the Data Register. Poke one of these numbers to the register which controls the direction of data flow (lines 102-103). Its name is Data Direction Register (DD for short):

* Receive	0
* Transmit	255

Here are the Data Direction Register Addresses:

* PET	59459
* VIC	37138
* 64	56579

No short cuts, please

The Data Direction Register will be set to zero, to receive, when you switch the machine on. Don't take short cuts in your programs and rely on this. Always poke the correct values for data direction. Your programs will then work under all circumstances – you may not have switched off since the last time the register was used. The same advice applies to all of the other registers described in this article. There is nothing particular in a computer unless you put it there!

PET sound causes problems

The PET and VIC interface chip has a register named Auxiliary Control Register (AC for short). Here are its addresses:

* PET	59467
*VIC	37147

The Auxiliary Control Register has some functions which can get in the way of successful transmission of data. By poking it with zero you will disable these other functions and you should have no trouble (line 90).

The register is also used on the PET to enable sounds to be produced from an amplifier connected to the user port. If there are pokes for sounds, elsewhere in your PET program, make sure that they don't spoil the user port communications. It is likely that the tiny speaker on 8000 series and 12" 4032 PETs uses this register. If so, you will need to disable the chime feature. These are the pokes to switch off the chime. I have not been able to test their effect on the Auxiliary Control Register, but with luck they should do the trick:

* FAT 4032	POKE 1004 ,0
* 8000	POKE 231 ,0

Keep in step

You need some way of controlling the flow of data between the two machines. It is done using the other two wires in your connector to provide a signalling system, known as "handshaking". At any moment, one machine will be the transmitter; the other will be the receiver. (You can't talk and listen at the same time, no matter how much you try!) So the handshaking system imposes rules which make the machines wait until one advises the other that:

* Either it is now ready to receive a data byte which the other machine is waiting to transmit;
* Or it has now transmitted a data byte which the other machine has signalled that it is ready to receive.

The receiver program may be slower in dealing with the data than the other is in transmitting it. If you do not include a handshake system in your programs they will get out of step. Data will be lost.

Hold hands

Handshake signals are produced by poking a 1 or a 0 to the transmitter's pin M register. The 1-0 signal is detected by peeking at pin B register at the other end. These two pins are wired together in the connector as described last month.

The signals are not detected in the same way as data signals. The chip does not recognise the 1 or the 0. Instead, it reacts to the *change* from one to the other. Your transmitter program has to do two pokes to send the signal (lines 2000-2001). This type of signal is known as a "strobe".

Do it the 64 way

The handshake has to be acceptable to all machines. Features in the Commodore 64 set the rules; it will only react to a change in the direction 1-0, and not the other way round. This direction is known as a "negative transition" (0-1 is "positive"). PET and VIC will react to a change in either direction (but not both at once). To have a compatible system, handshaking has to be done the Commodore 64 way.

Peripheral control defines the handshake

Both transmitter and receiver will need to send handshake signals. At the start of a program which runs on PET or VIC, you have to define whether it must recognise 1-0 or 0-1. Tell the interface chip to look for 1-0 (line 91). To do this, ensure that there is a 0 in a particular bit position in a register – at a well-known address in the PET. The register's name is Peripheral Control Register (PC for short). It is normally used to control the character generator in the PET and for cassette motor control in the VIC. Before you poke to it, the present settings must be preserved. Here are the pokes to use:

* PET
POKE 59468, PEEK (59468) AND 254

* VIC
POKE 37148, PEEK (37148) AND 239

There will be other pokes to this register each time you send the 1-0 handshake signal from a PET or VIC.

PET character generator
If your PET program switches between graphics mode and text mode later on, the Peripheral Control Register, just mentioned, will be affected. If you poke the values 12 or 14 to it, you will spoil its contents for handshaking. Use the following pokes instead. Watch out for the alternative CHR$(14) and CHR$(142) on fat 4032 and 8000 machines – they too will affect it:

* Graphics
POKE 59468, PEEK (59468) AND 252

* Text
POKE 59468, PEEK (59468) OR 14

There is no similar problem with VIC and Commodore 64.

Enabling the handshake
Before your program can actually send any handshake signals, certain bits must be set in a certain register (line 92). It is actually a different physical register, with a different name, in each machine. In my program I have called it Handshake Enable (HE for short), just to give it the same name for all machines. Use the following pokes at the start of your program:

* PET
POKE 59468, PEEK (59468) OR 224

* VIC
POKE 37148, PEEK (37148) OR 224

* 64
POKE 56578, PEEK (56578) OR 4

Giving the handshake
Now here is a trick to speed things up. The handshake signal is a 1 followed by a 0. The receiver will react to the *change* from 1-0. It will not matter how long ago the first 1 was received. All it will notice is that it has now changed. So send the first 1 at the start of the program (line 94).

It is also sent automatically from PET and VIC when handshaking is enabled by the poke values above; Commodore 64 would require the following additional poke:

* 64
POKE 56576, PEEK (56576) OR 4

When a 0 is sent later, the handshake is complete (line 2000). The time taken to poke it (after which the receiver will act) is half the time it takes to do two pokes – 1 followed by 0. So the receiver reacts more quickly, and gets on with handling the byte transmitted. In the meantime, the transmitter program sends a 1 ready for next time (line 2001). This is the reason why the pokes below look a little odd, but the apparent 0-1 sequence is not wrong. Sequences 0-0, 0-1, and 1-1 have no effect on the receiver.

I have named the register to poke as Handshake Output (HS for short) in my program so that it has a common name. In fact, it is not the same physical register in each machine. To send the handshake 0, and then 1 to get ready for the next:

* PET
POKE 59468, PEEK (59468) AND 223:
POKE 59468, PEEK (59468) OR 224

* VIC
POKE 37148, PEEK (37148) AND 223:
POKE 37148, PEEK (37148) OR 224

* 64
POKE 56476, PEEK (56576) AND 251:
POKE 56576, PEEK (56576) OR 4

Interrupt flag receives the handshake
When the interface chip detects the change 1-0, a bit is set in a register to let your program know that this has happened. Such bits are called 'flags'. The register is called the Interrupt Flag Register (IF for short) in the PET and the VIC, and called the Interrupt Control Register (IC) in the Commodore 64. Your program can peek at it to test if the 1-0 signal has been received yet (line 1000):

* PET
H=PEEK (59469) AND 2

*VIC
H=PEEK (37149) AND 16

*64
H=PEEK (56589) AND 16

If H is not zero, the signal hasn't yet been received.

If H is not zero, the handshake signal has been received, and a data byte has arrived at the user port. Your program can now peek at the Data Register to get it (line 320). This will also clear the handshake bit on PET and VIC. On Commodore 64 it will already have been cleared when your program peeked at the Interrupt Control Register.

Did you notice that I have had to use the abbreviation 'IC' (Commodore 64 usage) in my program?

If I had abbreviated Interrupt Flag to 'IF' the result would have been a BASIC key word. You cannot have key words in variable names, no matter how long the name is. Try BULLET=0 and see what happens. Then change the 'E' into an 'I'.

One more thing
Just in case the handshake signal is already set, your program should tidy up at the start. Otherwise, the first handshake or data byte might be ignored. After the earlier set-up pokes have been done, and as the last thing before transmission starts, do the following peeks to clear the handshake bit (line 93). I have named the addresses Handshake Tidy (HT for short):

* PET

Z=PEEK (59457)

* VIC
Z=PEEK (37136)

* 64
Z=PEEK (56589)
You can ignore the value of Z. It is the PEEK which does the work.

Next month some sample programs to: swap bytes between machines; peek at the other screen; print on it; move programs from machine to machine.

Future articles will cover how to: transfer variables, arrange master-and-slave and equal-partner communications, and how to use the interrupts.

```
10 REM          KEYBOARD CONNECTOR                    W.OWEN MURCOTT JULY 1983
11 REM-------------------------------------------------------------------------
20 REM                                              REGISTER ADDRESSES AND VALUES
30 DATA 59457,59459,59467,59468,59468,59468,59457,59469: REM                 PET
31 DATA 254,224,224,223,2
32 :
40 DATA 37136,37138,37147,37148,37148,37148,37136,37149: REM                 VIC
41 DATA 239,224,224,223,16
42 :
50 DATA 56577,56579,00828,00828,56578,56576,56589,56589: REM               CBM64
51 DATA 0,4,4,251,16
52 REM-------------------------------------------------------------------------
60 MT=PEEK(65534)+256*PEEK(65535): REM                      DETECT MACHINE TYPE
61 IF MT=65394 THEN FOR I=1 TO 13: READ Z: NEXT: GOTO 70: REM          IT'S VIC
62 IF MT=65352 THEN FOR I=1 TO 26: READ Z: NEXT: REM                 IT'S CBM64
63 REM                                                 ALL OTHERS ARE PET
64 REM-------------------------------------------------------------------------
70 REM                                              SET UP REGISTER ADDRESSES
71 READ DR : REM                    DATA REGISTER
72 READ DD : REM                    DATA DIRECTION
73 READ AC : REM                    AUXILIARY CONTROL  (DUMMY ADDRESS ON CBM64)
74 READ PC : REM                    PERIPHERAL CONTROL (DUMMY ADDRESS ON CBM64)
75 READ HE : REM                    HANDSHAKE ENABLE
76 READ HS : REM                    HANDSHAKE OUTPUT
77 READ HT : REM                    HANDSHAKE 'TIDY'
78 READ IC : REM                    INTERRUPT CONTROL
80 REM                                                SET UP REGISTER VALUES
81 READ K1 : REM                    TO DEFINE 1-0 HANDSHAKE (DUMMY ON CBM64)
82 READ K2 : REM                    TO ENABLE HANDSHAKE TO BE SENT
83 READ K3 : REM                    TO SET HANDSHAKE = 1
84 READ K4 : REM                    TO SET HANDSHAKE = 0
85 READ K5 : REM                    TO TEST HANDSHAKE RECEIVED
86 REM-------------------------------------------------------------------------
90 POKE AC,0: REM                          DISABLE AUXILIARY CONTROL FUNCTIONS
91 POKE PC, PEEK(PC) AND K1: REM           SET HANDSHAKE = 1-0
92 POKE HE, PEEK(HE) OR K2: REM            ENABLE HANDSHAKE
93 Z=PEEK(HT): REM                         ENSURE HANDSHAKE BIT IS CLEAR
94 POKE HS, PEEK(HS) OR K3: REM            SEND FIRST HANDSHAKE = 1
95 REM-------------------------------------------------------------------------
100 PRINT "PRESS R=RECEIVE S=SEND"
101 GETZ$
102 IFZ$="R" THEN POKE DD,0: GOTO 300: REM              DATA DIRECTION = IN
103 IFZ$="S" THEN POKE DD,255: GOTO 200: REM            DATA DIRECTION = OUT
104 GOTO 101
105 REM-------------------------------------------------------------------------
200 PRINT"PRESS 'RETURN' TO END"
210 GETZ$: IFZ$="" GOTO 210: REM                        GET KEY-PRESS
220 GOSUB 1000: REM                                     WAIT 'READY TO RECEIVE'
230 POKE DR,ASC(Z$): REM                                SEND CHARACTER
240 GOSUB 2000: REM                                     SEND 'CHARACTER SENT'
250 GOTO 210
260 :
300 GOSUB 2000: REM                                     SEND 'READY TO RECEIVE'
310 GOSUB 1000: REM                                     WAIT 'CHARACTER SENT'
320 A=PEEK(DR): REM                                     GET CHARACTER
330 IF A=13 THEN PRINT: PRINT"END": END
340 PRINT CHR$(A);: GOTO 300: REM                       PRINT IT
999 REM-------------------------------------------------------------------------
1000 IF (PEEK(IC) AND K5)=0 GOTO 1000: REM              WAIT HANDSHAKE
1001 RETURN
1002 REM-------------------------------------------------------------------------
2000 POKE HS, PEEK(HS) AND K4: REM                      SEND HANDSHAKE = 0
2001 POKE HS, PEEK(HS) OR K3: REM                       SEND HANDSHAKE = 1
2002 RETURN
```

Which WORD PROCESSOR

When we consider word processing on a micro computer, the potential for misunderstanding is unlimited. Until recently the purchase of a word processing system was a significant capital item which was beyond the means of many small businesses. The purchase of a computer represented an even bigger outlay, also beyond the horizon of the small businessman. With the business world moving at the increasingly fast pace caused by the advent of the computer orientated office many small businesses can now not reasonably afford not to have a word processing facility in the office.

Another consideration. How often do authors look at a letter and think "Well, it's all right but it does not convey what I wanted to say in exactly the right way. But it will cause too much aggravation to change it." An enormous amount of business is done via letters. Measuring the effect of sending out correspondence that is not word perfect is extremely difficult, but most businessmen will agree that the effort of trying to send out word perfect business correspondence is considerable.

Consider what processes are involved when applying a micro-computer to increase typing productivity. Typing is full of productivity pitfalls. Most authors are aware of the loss of output that a keying error on a typewriter will cause – the break of typing rhythm as a typist realises she has made an error, reaches for the whitening fluid and corrects the mistake. But how many authors are aware that there are many other pressures which make typing difficult?

As a typist reaches the end of a line on a page, she has to decide where to end the line and whether there is a large word near the right hand margin that will have to be hyphenated, wondering what the hyphenation rules are in each instance. However much they have typed, most girls will start the job again if they make, on average, more than three typing errors per page.

They also have to plan the layout of a document when there may be little indication about the length of dictation. And ask any typist what is involved in centering a heading or typing a column of figures where the decimal points must all be in a line vertically.

Typing inefficiency can also be the result of lack of organisation. The management of typists and secretaries is a specialised skill not always seen in businesses. Many word processor salesmen would be amazed to learn what productivity gains can be made through sensible allocation of tasks, and proper organisation.

Justifying the purchase of a word processor is another tricky area. Research work by the Stamford Research Institute in America has shown that investment in the office is running at well under 10% of investment in the shop floor, yet office costs are the most rapidly rising cost element in a business today. Whereas in 1975 it was estimated that the cost of the office was 40% of the cost of running a company, today the figure is more than 50%.

The main reason why investment in the office has been so low is that, it is an extremely difficult area to measure and control. The mathematics of investing in manufacturing capital equipment is much easier than the mathematics of investing in the office. After all we are not going to try to double the number of letters we produce every day. But if we can make the secretary more efficient through the use of word processing equipment and other machines and if we can use the spare time to remove routine tasks from the shoulders of the business manager, the returns can in a substantial way return the investment.

Also to define word processing as anything narrower than business communications is to overlook the technical trends that are taking place today. The word processor will in time become a general telecommunications terminal as well as the 'gateway' to integrated electronic systems. Such facilities will be available within the lifetime of equipment bought today. In the long term an understanding of word processing equipment can help educate the businessman in advanced office technology.

Not all micros are suitable for word processing and not all word processing programs are suitable for the secretarial office. A micro computer forming the basis of a word processor should have the following minimum specifications:

A screen capable of showing at any one time a minimum of 80 columns width of text and 15 lines of the page.

A keyboard fundamentally similar to a typewriter. There should be a shift key, preferably one either side of the space bar. There should be a key which can be accessed by the little finger of the right hand to delete the last character typed in.

The computer should have enough memory to give at least 10,000 text characters after the word processing program is loaded; 20,000 characters is even more desirable.

There should be at least two floppy disk drives.

The computer shold be able to drive a modem daisywheel printer.

For a word processing program to be used by a secretary, a number of purchasing criteria have to be considered. The typist is used to dealing with paper. She will think of a document in terms of the words on each page, and number of pages. For a typist to use a word processor in a satisfactory manner, it should appear to be similar to a typewriter.

We have talked about the importance

of the keyboard but we should also consider other aspects. Can the typist start typing on the word processor without going through any complicated setting-up procedures? As text is keyed in it must take up a position on the screen that closely matches what the typist would expect to see on paper. Without this facility the typist cannot gain a 'feel' for the document and she loses her ability to control the quality of the layout.

Alterations to the document involving margins, tabs and indentations must be simple and visual.

The typist should be able to see at all times what has been set at the point she has reached. It's no good asking her to take her fingers off the keyboard to verify what tabs have been set; that would be like asking a driver to take his hands off the wheel to check his speed.

Some security

Regarding amendments and deletions, here the program must offer some security against accidential loss of text. If text is entered but not stored on the disk how easy it is for that text to be lost. Does the system remind the operator that she has text in the computer memory that is not saved on disk?

The number of key strokes required to delete text should become slightly more complex as the amount of text that can be potentially lost increases. Deleting a character or a word should be a simple and swift operation. Deleting two pages of text should not be so swift and simple an operation or there is the danger that it will happen accidentally.

When the operator is editing a document she is working from an amended version of the document which the author has returned to her. The productivity of the re-type will depend on how easily the operator can identify the points of change on the screen. The process will involve her looking at the draft document, identifying the beginning of the line that contains the amendment, then trasferring her gaze to the screen and looking for the same relationship between the words beginning the line and the point within the line where the change is to be made.

The document on the computer screen must closely resemble the printed document. As the typist makes changes to the text, particularly when adding words, does the screen indicate exactly how the document will appear on paper? Several systems do not provide the operator with a 'printed look' until the document is ready to be sent to the printer. Clearly, this is unsatisfactory.

The special codes that need to be contained within the text to indicate to the computer such things as automatic centering, indentations and paragraph spacing are another consideration. If the control codes are visible on the screen they will distract the typist and she will have to keep reminding herself that these funny characters are only there on the screen and will not appear on the paper. Yet if the control codes are invisible she will be unable to determine exactly how the layout of the document was achieved. This is especially important if one girl is editing text typed in by another girl.

Essential requirements

This may seem like an unnecessarily strict set of criteria to apply to a word processing system that may cost as little as £3,000. However, if the microcomputer is to be regarded as a serious word processing machine then these requirements are essential.

Of course, it is all too easy to think that this type of machine can handle all typing work. This is not the case; there are still certain categories of typing work that need to be handled with care if they are to be done on a microcomputer.

Typing can be broken down into the following categories:

1. Letters and memos of less than 15 lines.
2. Letters and memos longer than 15 lines.
3. Multi-page documents subject to revision.
4. Documents containing partial standard text.
5. Standard documents or documents made up of standard paragraphs.
6. Standard letters.
7. The merging of standard paragraphs with lists.
8. The merging of standard letters with lists.
9. Forms

It is difficult to increase the productivity of documents which are under 15 lines in length. the typewriter, especially the correcting typewriter, is an efficient machine at producing short documents. Generally, a short document is one with which the typist is familar and the layout is minimal. The word processor gives the author the opportunity to make minor changes and shorter letters often have repetitions which might allow some standardisation.

As letters and documents become longer they are usually the product of more careful thought and the benefits of capturing a draft of the document on a word processor and allowing the author to amend it are enormous. A word processor allows the author to increase the speed of dictation. The author does not need to take care over syntax, grammar and logical order of dictation when he knows how quickly he can have a draft copy back to read and amend for subsequent final print-out.

Standard paragraphs

Two areas that need to be looked at carefully are categories 7 and 9. In certain business areas such as insurance there is a heavy requirement for the assembly of documents from standard paragraphs and the automatic merging with name and address lists. This would be extremely difficult to manage on microcomputers as they are at the moment although the facility is being developed.

Forms can be effectively handled on a standard word processor, but the microcomputer-based word processor can be bought with a variety of printers and paper handling devices. The dedicated word processor tends to be sold with one type of printer and therefore the knowledge of what that printer will do when handling forms is usually more detailed than that obtained from your local micro dealer. If you wish to process forms you should see the machine doing the job, using your form layout and your data, before you agree to buy the machine.

Finally, do not overlook the changes in organisation that can be made in the office. Secretaries suffer many interruptions. They are asked to perform important tasks but are also required to carry out a range of duties, including the trivial. Bringing together two or more staff members in a support group can provide some interesting benefits. The group can develop skills and allocate jobs.

If an important document needs to be typed, others within the group can protect the typist from interruptions. The members become familar with each other's work, thus coping with holiday and sickness absences more effectively.

The end result would seen to indicate that there is a great need for at least one system in any office. But which system? No one can choose a system for someone else. The actual choice may involve the pruchaser in lengthy discussion with various salesmen all of whom claim that their product is the best. We have compiled a small table of six packages that we feel cover most areas that any office would require. Our advice to the prospective buyer is to compare the features of each and then seek further information. It may take a little time and effort but this will be well rewarded.

BUSINESS WORDPROCESSING PACKAGES COMPARED

	PAGEWRITER	PAPERMATE +	WORDPOWER	SUBSCRIPT	WORDPRO 4	SIMPLY WRITE 64
PRICE	£39 + Vat	£45 + Vat	£40	£249	£395 + Vat	Tape £35 Disk £40
AVAILABLE FROM	SUPERSOFT	SUPERSOFT	K. PRETORIUS	PRECISION SOFTWARE	PROFESSIONAL SOFTWARE INC./WEGO	SIMPLE SOFTWARE
SUPPLIED AS	2K ROM	TAPE OR DISK	TAPE OR DISK	DISK	DISK	TAPE OR DISK
LANGUAGE	M. Code	Basic & M. Code	M. Code	M. Code	M. Code	M. Code
BASIC 2/3/4	Yes	Yes	Yes	Yes	Yes	Yes
Max. TEXT (A4)	3 pages	9 pages	12 pages	5 pages	PER SCREEN AREA 5 pages	8 pages
TEXT LINKING	No	Yes	Manually Only	Yes	Yes	Yes
MEMORY COUNTER	Yes	No	Yes	Yes	Yes	Yes
PRINTER	CBM PREFERRED	Any	Any	Any	Any	ASCII Any
PRINTER COMMANDS	Only Character mode	Fiddly	Yes	Yes	Yes	Yes
PRINTING SPEED	V. fast	Fast	Fast	V. fast	Fast	Fast
Adj. PAGE SIZE	Only at turn on	Yes	Yes	Yes	Yes	Yes
PAGE NUMBERING	Yes	Yes	Yes	Yes	Yes	Yes
DOUBLE SPACING	Manually	Yes	Yes	Yes	Yes	Yes
MARGINS	No	Yes	Yes	Yes	Yes	Yes
R. JUSTIFYING	No	Yes	Yes	Yes	Yes	Yes
TABULATION	No	Yes	Yes	Yes	Yes	Yes
CENTERING	No	Yes	Yes	Yes	Yes	Yes
KEYBOARD DEFINABLE	No	Yes	Yes	No	No	Yes
TYPING SPEED	Professional	Fast Amateur	Professional	Professional	Professional	Professional
EDITING	Limited	Fiddly	Superb	V. Good	V.V. Good	Good
FIND WITH REPEAT	No	Yes	Yes	Yes	Yes	No
FIND WITH CHANGE	No	Yes	Yes	Yes	Yes	Yes
MOVE TEXT BLOCK	Yes	Yes	Yes	Yes	Yes	Yes
WORDWRAPPING	No	Sometimes	Yes	Yes	Yes	No
PRINTOUT REVIEW	Yes	No	Yes	Yes	Yes	Yes
MULTIPLE COPIES	Up to 9	Yes	No	Yes	Yes	Yes
FORM LETTERS	No	Yes	No	Yes	Yes	Yes
TAPE USE	Yes	Yes	Yes	No	No	Yes
DISK USE	Yes	Yes	Yes	Yes	Yes	Yes
DISK COMMANDS	No	Basic 4 only	Yes	Yes	Yes	Yes
TEXT SAVED AS	Basic Prog	Seq file	Seq file	Basic Prog	Basic Prog	Seq file
NUMBER OF COMMANDS	Low	V. high	Moderate	High	High	High
EASE OF USE	Good	Fair	Good	V. Good	Good	V. Good
KNOWN BUGS	None	Stack overflow	None	None	None	None

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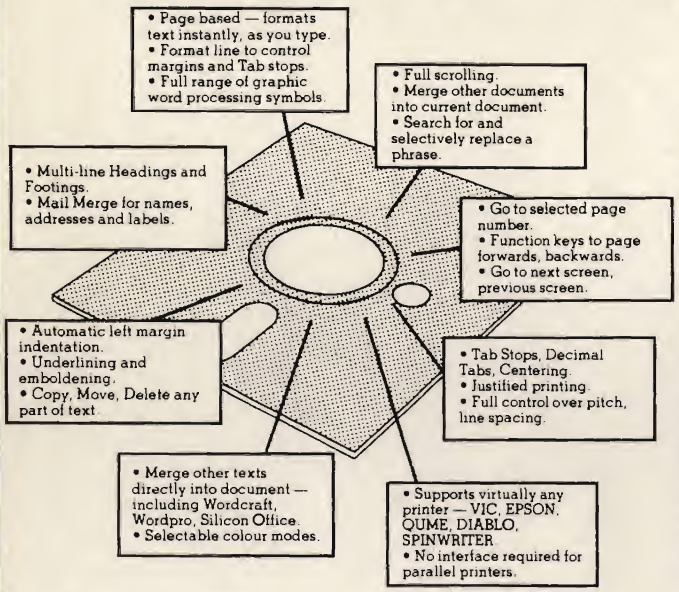

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More Useful Routines For All Machines

Sounds Interesting

The first is a routine which arose from a telephone conversation that I had with somebody wishing to have a routine to give a bleep from his VIC-20 every time a key is pressed. Realising that this could be a useful routine, I sat down and wrote it.

The basic idea of the routine is to make the VIC or 64 give off a bleep each time a key is pressed without having to do it within the BASIC program. This meant that it had to be in machine code and independent of the BASIC program. To do this, the routine is 'wedged' into the keyboard set up routine so that every time a key is pressed, this routine is carried out followed by the original routine.

There is a version for the VIC-20 and one for the 64. Both are presented as assembler routines and basic loaders that can be added to the start of your BASIC program. Beware, the routines reside in the cassette buffer. This means that the routine must be disabled before saving or loading from cassette otherwise the computer will crash. This can be done by pressing RUN/STOP-RESTORE.

```
CBM-64
SOUND......PAGE 0001

LINE# LOC   CODE        LINE


00001  0000             SID     =$D400
00002  0000             *       =$033C
00003  033C  78                 SEI
00004  033D  A9 49               LDA #<SOUND
00005  033F  8D 8F 02            STA $028F
00006  0342  A9 03               LDA #>SOUND
00007  0344  8D 90 02            STA $0290
00008  0347  58                 CLI
00009  0348  60                 RTS
00010  0349  08           SOUND  PHP
00011  034A  48                 PHA
00012  034B  8A                 TXA
00013  034C  48                 PHA
00014  034D  98                 TYA
00015  034E  48                 PHA
00016  034F  A5 C5               LDA $C5
00017  0351  CD 8A 03            CMP LAST
00018  0354  F0 2B               BEQ OUT
00019  0356  8D 8A 03            STA LAST
00020  0359  A9 0F               LDA #$0F
00021  035B  8D 18 D4            STA SID+24
00022  035E  A9 00               LDA #$00
00023  0360  8D 05 D4            STA SID+5
00024  0363  A9 05               LDA #$05
00025  0365  8D 06 D4            STA SID+6
00026  0368  A9 22               LDA #34
00027  036A  8D 01 D4            STA SID+1
00028  036D  A9 4B               LDA #75
00029  036F  8D 00 D4            STA SID
00030  0372  A9 20               LDA #$20
00031  0374  8D 04 D4            STA SID+4
00032  0377  A9 21               LDA #$21
00033  0379  8D 04 D4            STA SID+4
00034  037C  A9 20               LDA #$20
00035  037E  8D 04 D4            STA SID+4
00036  0381  68           OUT    PLA
00037  0382  A8                 TAY
00038  0383  68                 PLA
00039  0384  AA                 TAX
00040  0385  68                 PLA
00041  0386  28                 PLP
00042  0387  4C 48 EB            JMP $EB48
00043  038A  40           LAST   .BYT 64
00044  038B               .END


ERRORS = 00000


SYMBOL TABLE

SYMBOL VALUE
 LAST     038A    OUT      0381    SID      D400    SOUND    0349


END OF ASSEMBLY
```

Basic Loader For CBM-64

```
10 I=828:T=0
20 READ A
30 IF A=-1 THEN 70
40 POKE I,A
50 T=T+A
60 I=I+1:GOTO20
70 IF T<>8665 THEN PRINT"■DATA ERROR":END
80 SYS(828):END
100 DATA120,169,73,141,143,2,169
110 DATA3,141,144,2,88,96,8
120 DATA72,138,72,152,72,165,197
130 DATA205,138,3,240,43,141,138
140 DATA3,169,15,141,24,212,169
150 DATA0,141,5,212,169,5,141
160 DATA6,212,169,34,141,1,212
170 DATA169,75,141,0,212,169,32
180 DATA141,4,212,169,33,141,4
190 DATA212,169,32,141,4,212,104
200 DATA168,104,170,104,40,76,72
210 DATA235,64,-1
READY.
```

VIC-20
SOUND.VIC.....PAGE 0001

```
LINE# LOC   CODE        LINE

00001  0000              *       =$033C
00002  033C  78                  SEI
00003  033D  A9 49                LDA #<SOUND
00004  033F  8D 8F 02             STA $028F
00005  0342  A9 03                LDA #>SOUND
00006  0344  8D 90 02             STA $0290
00007  0347  58                  CLI
00008  0348  60                  RTS
00009  0349  08            SOUND  PHP
00010  034A  48                  PHA
00011  034B  8A                  TXA
00012  034C  48                  PHA
00013  034D  98                  TYA
00014  034E  48                  PHA
00015  034F  A5 C5                LDA $C5
00016  0351  CD 7E 03             CMP LAST
00017  0354  F0 1F                BEQ OUT
00018  0356  8D 7E 03             STA LAST
00019  0359  A9 0F                LDA #15
00020  035B  8D 0E 90             STA $900E
00021  035E  A9 E6                LDA #230
00022  0360  8D 0C 90             STA $900C
00023  0363  A2 64                LDX #100
00024  0365  A0 FF          LOOP  LDY #255
00025  0367  88            LOOP1 DEY
00026  0368  D0 FD                BNE LOOP1
00027  036A  CA                  DEX
00028  036B  D0 F8                BNE LOOP
00029  036D  A9 00                LDA #0
00030  036F  8D 0E 90             STA $900E
00031  0372  8D 0C 90             STA $900C
00032  0375  68            OUT   PLA
00033  0376  A8                  TAY
00034  0377  68                  PLA
```

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```
00035  0378  AA                TAX
00036  0379  68                PLA
00037  037A  28                PLP
00038  037B  4C DC EB          JMP $EBDC
00039  037E  00          LAST  .BYT 0
00040  037F              .END

ERRORS = 00000

SYMBOL TABLE

SYMBOL VALUE
 LAST     037E    LOOP     0365    LOOP1    0367    OUT      0375
 SOUND    0349

END OF ASSEMBLY
```

Basic Loader For VIC-20

```
10 I=828:T=0
20 READ A
30 IF A=-1 THEN 70
40 POKE I,A
50 T=T+A
60 I=I+1:GOTO 20
70 IF T<>8139 THEN PRINT"■DATA ERROR" END
80 SYS(828):END
100 DATA120,169,73,141,143,2,169
110 DATA3,141,144,2,88,96,8
120 DATA72,138,72,152,72,165,197
130 DATA205,126,3,240,31,141,126
140 DATA3,169,15,141,14,144,169
150 DATA230,141,12,144,162,100,160
160 DATA255,136,208,253,202,208,248
170 DATA169,0,141,14,144,141,12
180 DATA144,104,168,104,170,104,40
190 DATA76,220,235,0,-1
READY.
```

Using the Joystick

A few months ago, we had a routine that could wait for a certain switch to be set on the joystick of the 64. This is o.k. if all that you want to do is wait for the joystick. More often than not, however, the joystick will be used in games where the game must continue even if no switch from the joystick has been set. In this section we have two routines, one for the 64 and one for the VIC which read the joystick port and move a '*' over the screen depending on the direction required from the joystick. They both work in the same way and if the fire button is pressed, the '*' starts from the top left corner again.

CBM-64

```
5 PRINT"■";
10 A=PEEK(56320):REM PORT 2: 56321 FOR PORT 1
20 IF (AAND16)=0 THEN F=1
30 IF (AAND8)=0 THEN E=1
40 IF (AAND4)=0 THEN W=1
50 IF (AAND2)=0 THEN S=1
60 IF (AAND1)=0 THEN N=1
70 IF F THEN RUN
80 IF E THEN PRINT"■ *";
90 IF W THEN PRINT"■■ ■";
100 IF S THEN PRINT"■ ■";
110 IF N THEN PRINT"■ ■";
120 F=0:E=0:W=0:S=0:N=0:GOTO10
READY.
```

HINTS & TIPS

VIC-20

```
5 PRINT"■O■";:DD=37154:P1=37151:P2=37152
10 POKEDD,127:A=PEEK(P2)AND128
20 E=-(A=0)
25 POKE DD,255:A=PEEK(P1)
30 N=-((AAND4)=0)
40 S=-((AAND8)=0)
50 W=-((AAND16)=0)
60 F=-((AAND32)=0)
70 IF F THEN RUN
80 IF E THEN PRINT"■ ■";
90 IF W THEN PRINT"■■■ ■";
100 IF S THEN PRINT"■ ■■■";
110 IF N THEN PRINT"■ ■■■";
120 F=0:E=0:W=0:S=0:N=0:GOTO10
READY.
```

Define Away

For a long time, I have thought how good it would bed to be able to define a user defined character in the same way as it is defined on, say, the BBC. The method for defining user defined characters on the BBC is by a call: VDU23,charno,a,b,c,d,e,f,g,h. This defines the character number charno with the numbers a,b,c,d,e,f,g,h as each line on the character.

The following routine includes two routines, the first actually goes into user defined character mode, selecting bank 2 and copies the full character ROM into RAM, this is done by SYS49152. The second routine is the call to define the character. This is done by SYS49408,charno,a,b,c,d,e,f,g,h.

The selection of bank 2 is so that there is still plenty of user RAM available to the user for basic programs (There is still 29K of basic programming memory). Some new conventions must therefore be noted; The screen starts at location 32768 and not 1024, Sprite pointers are at locations 33784-33791 instead of 2040-2047, and your Sprites will be stored in memory between 33792 and 40959.

With the first call, to set up the user defined character mode, it must be noted that there is a clear screen in the routine. We hope that these two routines may be of some use to you for writing programs.

```
63000 I=49152:T=0
63010 READ A
63020 IF A=-1 THEN63060
63030 POKE I,A:T=T+A
63040 I=I+1
63050 GOTO63010
63060 IF T<>12102 THEN PRINT"DATA ERROR BLOCK #1":END
63070 I=49408:T=0
63080 READ A
63090 IF A=-1 THEN63130
63100 POKE I,A:T=T+A
63110 I=I+1
63120 GOTO63080
63130 IF T<>9574 THEN PRINT"DATA ERROR BLOCK #2":END
63140 END:REM       ALL DATA ENTERED OK
63150 DATA169,0,133,87,169,208,133
63160 DATA88,169,0,133,89,169,176
63170 DATA133,90,173,14,220,41,254
63180 DATA141,14,220,165,1,41,251
63190 DATA133,1,160,0,177,87,145
63200 DATA89,24,165,87,105,1,133
63210 DATA87,133,89,144,241,230,88
63220 DATA230,90,165,88,201,224,208
63230 DATA231,165,1,9,4,133,1
63240 DATA173,14,220,9,1,141,14
63250 DATA220,173,2,221,9,3,141
63260 DATA2,221,173,0,221,41,252
63270 DATA9,1,141,0,221,169,128
63280 DATA141,136,2,133,56,132,52
63290 DATA169,12,141,24,208,32,68
63300 DATA229,96,-1
63310 DATA32,253,174,32,235,183,132
63320 DATA91,133,92,160,3,165,20
63330 DATA133,88,165,21,133,89,134
63340 DATA90,24,6,88,38,89,136
63350 DATA208,248,169,176,24,101,89
63360 DATA133,89,201,191,144,3,76
63370 DATA72,178,169,0,133,87,165
63380 DATA90,154,87 145,88,162,0
63390 DATA164,91,165,92,32,241,183
63400 DATA134,90,230,87,165,87,201
63410 DATA7,208,231,165,90,164,87
63420 DATA145,88,96,-1
READY.
```

User Contributions

If you have discovered any interesting locations and uses on your Commodore machine or written any useful little routines (in BASIC or machine code), we will be very interested to hear from you.

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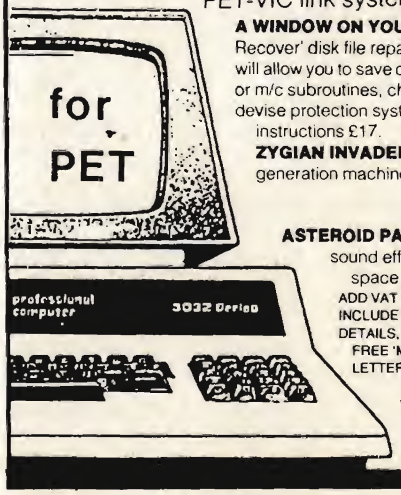

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INSIDE BASIC

FLOATING POINT HINTS

When a floating point number is stored in memory it is compressed to five bytes by storing the sign as bit seven of the most significant byte of the mantissa, in the following format:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Exponent	Sign bit & Mantissa 1	Man-tissa 2	Mantissa 3	Mantissa 4

The storage of data within these five bytes is fairly complex and the following is an explanation of what is stored in each byte:

Exponent: bit 7 of the exponent bytes indicates the sign of the exponent, if greater than 128 then the exponent is positive (bit 7 = 1) and if less then negative (bit 7 + 0). The exponent is stored as a power of 2 and is multiplied by the mantissa values to give the final value. The following formula can be used to convert a number stored in the mantissa bytes N into the full floating point number by multiplying it by the mantissa:

2 (E-129) * N

to determine the exponent of a number find the highest power of 2 which can be subtracted from the number, thus if the number is 18,256 the highest power of 2 is 16 or 2 4, the exponent value is positive and therefore equals – 129+4 or 133.

The sign bit: if the sign bit which is stored in bit 7 of mantissa 1 is 0 then the mantissa value is positive, if bit 7 = 1 then negative.

Mantissa: the mantissa is stored in four bytes less the most significant bit of mantissa 1 which is used to store the sign bit. To convert a number stored in the mantissa into its numeric equivalent use the following formula:

N = ((M1 and 127)+(M2+(M3+M4/256)/256)/256)/128

where M1, M2, M3 and M4 are the values in each of the mantissa bytes. To convert a number into the mantissa value first remove the exponent portion as outlined above, then perform the following series of calculations:

the power of 2 extracted for the exponent = E
remainder after subtracting exponent value = R

TO = (R/E)*128
M1 = INT(TO)= Sign : sign = 128 if positive 0 if neg
T1 = (TO-INT(TO))*256
M2 = INT(T1)
T2 = (TI-INT(TI))*256
M3 = INT(T2)
T3 = (T2-INT(T2))*256
M4 = INT(T3)

Where M1, M2, M3, and M4 are the four mantissa byte values.

The following are examples of the storage of some floating point numbers:

Number	Exponent	Mantissa 1	Mantissa 2	Mantissa 3	Mantissa 4	Sign
1	$81	$80	$00	$00	$00	$00
-1	$81	$80	$00	$00	$00	$FF
.5	$80	$80	$00	$00	$00	$00
.25	$7F	$80	$00	$00	$00	$00
1E38	$FF	$96	$76	$99	$52	$00
1E-39	$00	$AO	$00	$00	$00	$00

8032 SYSTEM LOCATIONS

$B9F6 – Get fixed point number from Basic

On entry to this routine the accumulator folds the value previously read by GETCHAR from the Basic program, if this is non-numeric then the routine subtracting $2F, the number is placed in location $03. The contents of $03 is added to the contents of locations $11,$12 both of which are initially set to zero. The next character is then obtained from Basic and the routine repeated, this time the contents of locations $11,$12 are multiplied by 10 using a series of shifts and rotations. This process is repeated until a non numeric value is obtained from Basic. This then leaves the integer value in locations $11,$12 and the CHARGOT pointer $77,$78 pointing to the next character in Basic.

$BD98 – Evaluate expression

A long and important routine which parses any expression, numeric or string, checking for syntax errors and evaluating the type of expression and result. The routine evaluates an expression whose starting address is pointed to by the CHARGET pointers $77,$78. Since the routine involves a lot of stack processing it first checks that there is sufficient space (it should be noted that long and complete expressions can generate ?OUT OF MEMORY ERRORs because of insufficient stack space). The expression type is determined and stored in location $07, a contents of $FF = string expression, and $00 = numeric. A series of routines then evaluate the expression and if it is numeric store the result in floating accumulator #1. If it is a string expression then the string length is stored in the accumulator and the string pointer is in location $61,$62. The following are the entry points and function of some of the routines used:

$BDB2 – test for combination of ›,‹ or = and store code in $4A
$BDD1 – process string operators
$BE1A – push argument in floating accumulator #1 onto the stack. Stack format as follows:

Stack location
1
2 $BDF7 return address
3
4 operation address
5
6
7 floating accumulator # value
8
9
10
11 compare flag
12 hierarchy

$BE56 – put stack contents into floating accumulator #2 and put exponent into accumulator
$BE81 – evaluation routine checks for ASCII numeric strings and operators
$BEA0 – pi in floating point
$BEE9 – evaluate expression within parantheses
$BEEF – check paranthesis, comma
$BF00 – SYNTAX ERROR and exit to READY

$C086 – Perform OR, AND

This one routine covers both logical operations, a flag in locations $05 determines which operation is performed, $FF = OR, and $00 = AND. The entry point for OR is $C086 and AND is $C089. The arguments are stored in floating accumulator #1 and floating accumulator #2, the result is stored in floating accumulator #1.

$C0B6 – Perform comparisons

This routine is in two parts, numeric comparison and string comparison. Numeric comparison is done by a routine at location $CD91 which uses the values set up in floating accumulator #1 and #2 by the numeric comparison routine, start address $C0BB. The result of the comparison is stored in the accumulator, 0 means values are equal, 1 means FAcc #1 is greater than FAcc #2 and FF means FAcc #1 is less than FAcc #2. The string comparison routine starts at $C0CE. The pointer to the start of string #1 is stored in $61,$62 and string #2 in $69,$6A. The X register holds the result of the comparison, X = 0 then strings are equal, X = 1 then string #1 is greater than string #2, and X = $FF then string #1 is less than string #2. The flag showing which comparison was performed is stored in $07, $FF = numeric, $00 = string.

$C2DD – Evaluate integer expression

This takes an expression from Basic and evaluates it. If the result is positive and less than 32768 it is converted into a two byte number which is stored in locations $61,$62 of floating accumulator #1.

$C4BC – Convert fixed-to-floating

The two byte integer value is held in A (high) and Y (low). The routine converts these into floating point form in FAcc #1.

$C92D – Convert floating to fixed point

The floating point value in FAcc #1 is converted to a two byte integer (providing it is within the range 0-65535), the result is stored in $11 and $62 (low order byte) and $12 and $61 (high order byte).

$C986 – Perform subtraction

The contents of FAcc #1 is subtracted from FAcc #2 and the result stored in FAcc #1. There are two entry points to this routine, $C989 assumes that the values are already loaded into the two floating accumulators. $C986 first loads FAcc #2 with a five byte floating point value stored in a memory location pointed to by the accumulator (low order) and Y index register (higher order).

$C998 – Perform addition

The contents of FAcc #1 is added to FAcc #2 and the result stored in FAcc #1. A 5 byte floating point value is first loaded into FAcc #2 from a memory location pointed to by the accumulator (low order) and the Y index register (high order).

$CA7D – Compliment FAcc #1

This routine replaces the contents of FAcc #1 by its 2's compliment – this means that all the zeros are converted to ones and vice versa then one is added to the value.

$CAB9 – Multiply a byte subroutine

$CB20 – Perform LOG

This performs the calculation of LOG to the base e on a value stored in FAcc #1 and put the result in FAcc #1.

$CB5E – Perform multiplication

The contents of FAcc #1 is multiplied by the contents of FAcc #2 and the result stored in FAcc #1. On entry FAcc #2 is first loaded with a 5 byte floating point value stored in memory at a location pointed to by the accumulator (low order) and the Y index register (high order).

$CBC2 – Unpack memory into FAcc #2

This takes a value stored as a five byte variable in memory at an address pointed to by the accumulator (low order) and Y index register (high order), unpacks the sign byte and stores the value in the six bytes of FAcc #2.

$CBED – Test and adjust accumulators

This checks the exponent values of the two floating point accumulators and if the values are too large or small generates an OVERFLOW ERROR before setting the contents of FAcc #1 to zero. If either accumulator is zero then both will be set to zero by this routine.

$CC18 – Multiply by 10

The contents of FAcc #1 is multiplied by 10 and the result stored in FAcc #1.

$CC34 – Divide by 10

The contents of FAcc #1 is divided by 10 and the result stored in FAcc #1.

$CC3D – Perform divide-by

This divides FAcc #1 by FAcc #2 and puts the result in FAcc #1. On entry the pointer to the 5 byte floating point value to be stored in FAcc #1, is contained in the accumulator (low order) and the Y index register (high order), and the X index register is loaded with the sign comparison byte-$6C. The contents of FAcc #1 is then divided by the contents of FAcc #2, which is loaded prior to routine entry, and the result stored in FAcc #1, leaving FAcc #2 unchanged.

$CC45 – Perform divide-into

This divides FAcc #1 into FAcc #2 and puts the result in FAcc #1. On entry the location of the 5 byte floating point value to be put in FAcc #2 is pointed to by the contents of the accumulator (low order) and Y index register (high order).

$CCD8 – Unpack memory into FAcc #1

This loads a value stored as a 5 byte floating point number, extracts the sign byte and then stores it in the 6 bytes of FAcc #1. The location of the value in memory is pointed to by the contents of the accumulator (low order) and the Y index register (high order).

$CD0A – Pack contents of FAcc #1 into memory location

This compresses the six bytes of FAcc #1 into 5 bytes by storing the sign byte as the most significant bit of the mantissa MSB. These five bytes are then stored in a memory location pointed to by the X index register (low order) and Y index register (high order).

$CD32 – Move FAcc #2 to FAcc #1

This moves the entire contents of FAcc #2 into FAcc #1, leaving both containing the same value. The rounding byte $6D is zeroed.

$CF93 – Convert floating point to ASCII

The contents of FAcc #1 is converted to an ASCII string stored in a buffer, starting at location $0100. On exit from the routine a zero terminating byte is placed at the end of the string and the buffer starting address is stored in the accumulator (low order) and Y index register (high order).

$D108 – Perform SQR

The contents of FAcc #1 (the argument) is transferred to FAcc #2, FAcc #1 is then loaded with .5 and the routine jumps to the perform power routine at $D112. The result is stored in FAcc #1.

$D112 – Perform power function

The contents of FAcc #2 is raised to the power of the value stored in FAcc #1, the result is placed in FAcc #1. Before using this routine the sign comparison byte in $6F should be set, this is done by exclusively ORing the contents of the two sign bytes, $66,$6E, and storing the result in $6F. The exponent of the value stored in FAcc #1 should be stored in $61 prior to running this routine.

$D14B – Perform negation

This negates the contents of FAcc #1 and performs an EOR on the sign byte with $FF.

SD184 – Perform EXP

The value of e to the power of the contents of FAcc #1 is calculated and the result stored in FAcc #1.

$D1D7 – Series evaluation

A function is evaluated by this routine and the result stored in FAcc #1. On entry the accumulator (high order) and Y index register (low order) point to the start address of the first variable to be evaluated in the series. This uses FAcc #1 and work space in $54 to $58.

$D282 – Perform COS

The argument in radians is stored in FAcc #1 this is then added to a value of pi/2 stored in FAcc #2 and the result stored in FAcc #1. The routine then jumps to the perform SIN routine at $D289, the result is stored in FAcc #1.

$D289 – Perform SIN

The argument in radians is stored in FAcc #1, it is evaluated to give the sine of the angle, this is stored in FAcc #1.

$D2D2 – Perform TAN

The TAN of the argument in FAcc #1 is calculated by dividing the sine of the value by its cosine using the routines at $D289 and $D282. The result is stored in FAcc #1.

$D32C – Perform ATN

The arctangent of a value in radians stored in FAcc #1 is calculated and the result stored in FAcc #1.

$CD42 – Move FAcc #1 to FAcc #2

This moves the entire contents of the six bytes of FAcc #1 into FAcc #2, leaving both containing the same value. The rounding byte $6D is zeroed.

$CD51 – Round FAcc #1

The exponent of FAcc #1 in byte $5E is tested, if the contents is zero the routine exists, if not then the rounding byte in $6D is multiplied by two and the state of the carry flag checked. If carry is clear then it exits. If carry is set then the floating point value is incremented by one.

$CD61 – Get FAcc #1 sign

this finds the sign of the value in FAcc #1 and stores it in the accumulator. If the accumulator = $01 then the value is positive, $FF = negative and $00 the contents is zero.

$CD6F – Perform SGN

The routine at $CD61 is called and the sign of the value in FAcc #1 put in location $5F of FAcc #1. Location $5E is set to $88 and the other 5 bytes set to zero.

$CD8E – Perform ABS

This simply ensures that the sign byte $63 always contains a positive flat – $01.

$CD91 – Compare FAcc #1 to value in memory

The value stored in FAcc #1 is compared with a five byte floating point value stored in memory at a location pointed to by the accumulator (low order) and Y index register (high order). On exit the accumulator contains the comparison flat: $00 = that both values are equal, $01 = means that FAcc #1 is greater than the value in memory and $FF = that FAcc #1 is less than the value in memory.

$CDD1 – Floating to fixed point conversion

The floating point number is stored in FAcc #1 and is converted to a two byte fixed point number which is stored in $11 and $62 (low order) and $12 and $61 (high order). If the value in FAcc #1 is greater than 32768 then the overflow is stored in $60.

$CE02 – Perform INT

The value stored in FAcc #1 is rounded down to the nearest integer but is left in full floating point form in FAcc #1.

$CE29 – Convert string to floating point

The string to be converted is stored at a location pointed to by CHARGET pointers at $77,$78. The numeric value stored in the string is checked and then converted to floating point form in FAcc #1. This routine is used by VAL.

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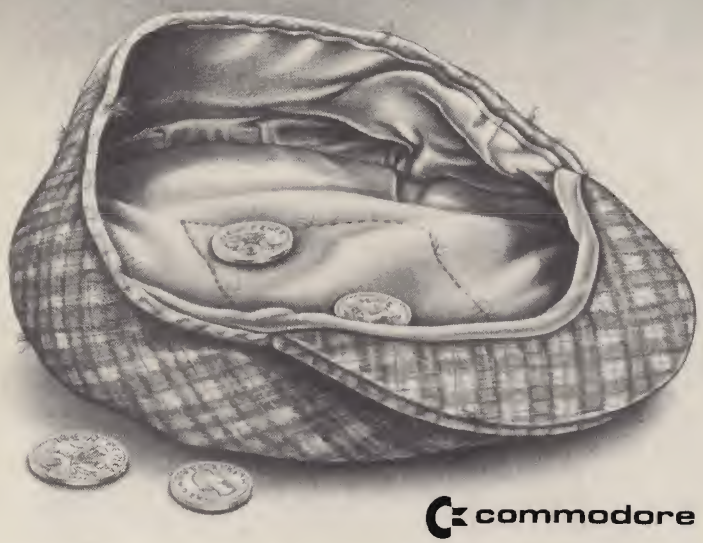

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BASIC PROGRAMMING

This month we have a collection of programs for the PET and the 64. the first is an arcade type game for the 40 column PET's and the other two are games for the 64. The 64 games are a fruit machine game and a horse racing game by Bill Russell. Also a game for the PET called PETDO, written by Graham Jones. But first:

FRUIT MACHINE

A computer version of a one armed bandit for the 64. This program makes good use of sound, and the instructions are built into the program.

```
10 PRINT"□":CLR
20 NO=0:POKE54296,15
30 GOTO3240
40 REM :
50 REM 'FRUIT MACHINE' PROGRAM
60 REM ADAPTED BY BILL RUSSELL
70 REM DATE: 15TH FEB. 1983
80 REM *** VARIABLES ***
90 REM REEL DATA - DT
100 REM LOOPS FOR REELS - II,JJ
110 REM PLAYER'S MONEY - MY
120 REM POKE LOCATIONS - L1..3
130 REM START OF REELS - P1..3
140 REM REEL CO-ORDS - X,Y
150 REM REEL COLOURS - CL
160 REM HOLD REEELS - HD1..3
170 REM RANDOM PLAYING - RN
180 REM RANDOM SPIN - RS
190 REM LOOP - I
200 REM PLAYER'S CHOICE - PL$
210 REM RANDOM NUDGE - RG
220 REM MONEY WON - M
230 REM NUMBER OF TRIES - NO
240 REM LIMIT TRIES - LM,LM$
250 REM START/RESTART PLAY - Q$
260 REM :
270 REM DATA FOR REELS
280 DIMDT(3,20)
290 REM REEL #1
300 DATA28,83,83,65,42,81,65,65,83,65
310 DATA83,81,42,28,83,42,65,81,83,42
320 REM REEL #2
330 DATA65,65,81,28,83,65,42,65,81,83
340 DATA81,65,42,81,83,42,28,65,83,83
350 REM REEL #3
360 DATA42,65,28,65,42,81,65,83,81,65
370 DATA83,65,65,28,81,42,83,81,42,65
380 REM READ IN DATA
390 FOR II=1 TO 3
400 FOR JJ=1 TO 20
410 READ DT(II,JJ)
420 NEXT JJ:NEXT II
430 REM SET START POSITION
440 P(1)=1:P(2)=7:P(3)=15
450 REM SET SCREEN
460 PRINT"□":POKE53280,6:POKE 53281,6
470 PRINTTAB(11)"■■ 'FRUIT MACHINE' ■"
480 PRINT"■ WIN LINES"
490 PRINT"■£££ - £1.00"
```

```
500 PRINT"££X - £0.50"
510 PRINT"*** - £0.20"
520 PRINT"●●● - £0.20"
530 PRINT"♠♠♠ - £0.20"
540 PRINT"♥♥♥ - £0.20"
550 PRINT"**X - £0.10"
560 PRINT"●●X - £0.10"
570 PRINT"♠♠X - £0.10"
580 PRINT"♥♥X - £0.10"
590 REM PRINT FRUIT MACHINE
600 PRINT"
610 PRINTTAB(14)"
620 PRINTTAB(14)"
630 PRINTTAB(14)"
640 PRINTTAB(14)"
650 PRINTTAB(14)"
660 PRINTTAB(14)"
670 PRINTTAB(14)"
680 PRINTTAB(14)"
690 PRINTTAB(14)"
700 PRINTTAB(14)"
710 PRINTTAB(14)"
720 PRINT"
730 PRINTTAB(14)"
740 PRINTTAB(14)"
750 PRINT"
760 PRINTTAB(36)"
770 PRINT"
780 PRINTTAB(14)"
790 PRINT"■MONEY 0000"
800 REM SET UP PLAY ROUTINE
810 PRINT"■":GOTO870
820 REM SET CURSOR POSITION
830 PRINT"
840 PRINTTAB(14)"
850 PRINT"
860 RETURN
870 MY=50
880 HD(1)=0:HD(2)=0:HD(3)=0
890 GOSUB820
900 PRINTTAB(15)"YOU START WITH 50P"
910 FORZ=1TO1500:NEXTZ:GOSUB940
920 GOSUB1000
930 GOTO1350
940 REM RESET MONEY ROUTINE
950 PRINT"
960 PRINT"
970 PRINT"■MONEY "MY
980 PRINT"TRIES "NO
990 FORZ=1TO500:NEXTZ:RETURN
1000 REM SET UP REELS ROUTINE
1010 L(1)=1521:L(2)=1527:L(3)=1533
1020 FORX=1TO3
1030 IF HD(X)=1 THEN1090
1040 Y=P(X)
1050 FORJJ=0TO2
1060 POKEL(X)+JJ,(DT(X,Y))+128
1070 POKEL(X)+JJ+54272,1
1080 NEXT JJ
1090 REM SET ABOVE LINE
1100 IFHD(X)=1THEN1170
```

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```
1110 IFP(X)=1THEN1290
1120 Y=(P(X))-1
1130 FORJJ=0TO2
1140 POKE(L(X)+JJ)-80,(DT(X,Y))+128
1150 POKEL(X)+JJ+54192,1
1160 NEXT JJ
1170 REM SET NEXT ABOVE LINE
1180 IF HD(X)=1THEN1260
1190 IF P(X)=2 THEN1310
1200 IF P(X)=1 THEN1330
1210 Y=(P(X))-2
1220 FORJJ=0TO2
1230 POKE(L(X)+JJ)-160,(DT(X,Y))+128
1240 POKEL(X)+JJ+54072,1
1250 NEXT JJ
1260 GOSUB2780
1270 NEXTX
1280 RETURN
1290 REM Y-1 IS ZERO
1300 Y=20:GOTO1130
1310 REM Y-2 IS ZERO
1320 Y=20:GOTO1220
1330 REM Y-2 IS NEG
1340 Y=19:GOTO1220
1350 REM START PLAYING
1360 GOSUB820
1370 PRINTTAB(15)"PRESS 'S' TO STOP"
1380 FORZ=1TO1500:NEXTZ
1390 RN=INT(RND(0)*9)+1:NO=NO+1
1400 MY=MY-5:M=0:IFMY<0THEN2490
1410 IF NO=LM THEN2660
1420 IF MY=-1 THEN2660
1430 GOSUB940
1440 IF RN=9THEN1800
1450 IF RN=8THEN2070
1460 GOSUB820
1470 PRINTTAB(15)"PRESS 'P' TO PLAY"
1480 GET PL$:IF PL$=""THEN1480
1490 IF PL$="S" THEN2660
1500 IF PL$<>"P" THEN1480
1510 REM STRAIGHT PLAY ROUTINE
1520 GOSUB3030
1530 HD(1)=0:HD(2)=0:HD(3)=0
1540 RS=INT(RND(0)*4)+4
1550 FORI=1TORS
1560 IF HD(1)=1 THEN1590
1570 P(1)=P(1)-1
1580 IFP(1)=0THEN P(1)=20
1590 IF HD(2)=1 THEN1620
1600 P(2)=P(2)-1
1610 IFP(2)=0THEN P(2)=20
1620 IF HD(3)=1 THEN1650
1630 P(3)=P(3)-1
1640 IFP(3)=0THEN P(3)=20
1650 GOSUB1000
1660 NEXTI
1670 IF HD(2)=1 THEN1700
1680 P(2)=P(2)-1
1690 IFP(2)=0THEN P(2)=20
1700 IF HD(3)=1 THEN1770
1710 P(3)=P(3)-1
1720 IFP(3)=0THEN P(3)=20
1730 P(3)=P(3)-1
1740 IF HD(3)=1 THEN1770
1750 IFP(3)=0THEN P(3)=20
1760 GOSUB1000
1770 FORZ=1TO500:NEXTZ
1780 GOSUB2220
1790 GOTO1350
1800 RG=0:REM NUDGE ROUTINE
1810 RG=INT(RND(0)*5)+1
1820 HD(1)=1:HD(2)=1:HD(3)=1
1830 GOSUB820
1840 PRINTTAB(15)"YOU HAVE "RG" NUDGES"
1850 FORZ=1TO1500:NEXTZ
1860 GOSUB820
1870 PRINTTAB(15)"USE NUDGE (Y/N)"
1880 GET PL$:IFPL$=""THEN1880
1890 IF PL$="N" THEN1510
1900 IF PL$<>"Y" THEN1880
1910 I=1
1920  GOSUB820
1930 PRINTTAB(15)"NUDGE REEL "I" (Y/N)"
1940 GET PL$:IFPL$=""THEN1940
1950 IF PL$="Y" THEN1990
1960 IF PL$<>"N" THEN1940
1970 I=I+1:IF I=4THEN1910
1980 GOTO1920
1990 HD(I)=0
2000 P(I)=P(I)-1
2010 IFP(I)=0THEN P(I)=20
2020 GOSUB1000
2030 GOSUB2220
2040 IF M>0 THEN RG=1
2050 RG=RG-1:IFRG=0THEN1350
2060 GOTO1830
2070 REM HOLD ROUTINE
2080 GOSUB820
2090 HD(1)=0:HD(2)=0:HD(3)=0
2100 PRINTTAB(15)"YOU HAVE A HOLD"
2110 FORZ=1TO1500:NEXTZ
2120 FORI=1TO3
2130 GOSUB820
2140 PRINTTAB(15)"HOLD REEL "I" (Y/N)"
2150 GET PL$:IF PL$="" THEN2150
2160 IF PL$="Y" THEN HD(I)=1:GOTO2180
2170 IF PL$<>"N" THEN2150
2180 NEXT I
2190 GOTO1540
2200 GOSUB2220
2210 GOTO1350
2220 REM CHECK WIN LINE ROUTINE
2230 HD(1)=0:HD(2)=0:HD(3)=0
2240 REM CHECK £'S
2250 IF DT(1,P(1))<>28 THEN2290
2260 IF DT(2,P(2))<>28 THEN2490
2270 IF DT(3,P(3))<>28 THEN M=50:GOTO2540
2280 M=100:GOTO2540
2290 REM CHECK STARS
2300 IF DT(1,P(1))<>42 THEN2340
2310 IF DT(2,P(2))<>42 THEN2490
2320 IF DT(3,P(3))<>42 THEN M=10:GOTO2540
2330 M=20:GOTO2540
2340 REM CHECK SPADES
```

```
2350 IF DT(1,P(1))<>65 THEN2390
2360 IF DT(2,P(2))<>65 THEN2490
2370 IF DT(3,P(3))<>65 THEN M=10:GOTO2540
2380 M=20:GOTO2540
2390 REM CHECK BLOBS
2400 IF DT(1,P(1))<>81 THEN2440
2410 IF DT(2,P(2))<>81 THEN2490
2420 IF DT(3,P(3))<>81 THEN M=10:GOTO2540
2430 M=20:GOTO2540
2440 REM CHECK HEARTS
2450 IF DT(1,P(1))<>83 THEN2490
2460 IF DT(2,P(2))<>83 THEN2490
2470 IF DT(3,P(3))<>83 THEN M=10:GOTO2540
2480 M=20:GOTO2540
2490 REM NO WIN
2500 GOSUB820
2510 PRINTTAB(15)"NO WIN !"
2520 GOSUB3130
2530 RETURN
2540 REM MONEY WIN
2550 GOSUB820
2560 PRINTTAB(15)"YOU WON "M" P !"
2570 GOSUB2930
2580 PRINT"■■■■■■■■■■■■■■■■■■■■"
2590 FORJ=1TO(M/10)
2600 PRINTTAB(19+J)"■■";:GOSUB2860
2610 NEXTJ:PRINT"■"
2620 FORZ=1TO1500:NEXTZ
2630 PRINT"■■■■■■■■■■■■■■■■■■■■"TAB(18)"
2640 MY=MY+M:GOSUB940
2650 PRINT"■":RETURN
2660 REM END ROUTINE
2670 PRINT"■"
2680 POKE53280,14
2690 PRINTTAB(15)"■ GAME OVER ■"
2700 PRINT"■ YOU FINISHED WITH £"(MY/100)+.05
2710 PRINT"■ FROM A START OF £0.50"
2720 PRINT"■ TAKING A TOTAL OF "NO-1" TURNS."
2730 PRINT"■    ■ WILL YOU PLAY AGAIN (Y OR N) ■"
2740 GET Q$:IFQ$=""THEN2740
2750 IF Q$="Y"THEN10
2760 IF Q$="N"THEN3830
2770 GOTO2740
2780 REM SOUND EFFECT #1
2790 REM BELL WHEN REEL STOPS
2800 POKE54276,65:POKE54277,8:POKE54278,100
2810 POKE54275,50:POKE54274,200
2820 POKE54273,50:POKE54272,100
2830 FORZ=1TO50:NEXTZ
2840 POKE54276,0
2850 RETURN
2860 REM SOUND EFFECT #2
2870 REM COINS DROPPING
2880 POKE54276,129:POKE54277,8:POKE54278,100
2890 POKE54273,1:POKE54272,255
2900 FORZ=1TO50:NEXTZ
2910 POKE54276,0
2920 RETURN
2930 REM SOUND EFFECT #3
2940 REM WINNING CHIME
2950 POKE53280,1
2960 FORK=10TO25
```

```
2970 POKE54276,33:POKE54277,8:POKE54278,8
2980 POKE54273,K:POKE54272,250-K
2990 FORZ=1TO30:NEXTZ
3000 POKE54276,0
3010 NEXTK:POKE53280,6
3020 RETURN
3030 REM PULL HANDLE
3040 PRINT"■
3050 PRINTTAB(36)" ":PRINTTAB(36)"●"
3060 FORZ=1TO50:NEXTZ
3070 PRINT"□"TAB(36)" ":PRINTTAB(36)"●"
3080 FORZ=1TO50:NEXTZ
3090 PRINT"□□"TAB(36)"●":PRINTTAB(36)"|"
3100 FORZ=1TO50:NEXTZ
3110 PRINT"□□□"TAB(36)"●":PRINTTAB(36)"|"
3120 RETURN
3130 REM SOUND EFFECT #4
3140 REM NO WIN CHIME
3150 FORK=1TO5
3160 POKE54276,17:POKE54277,8:POKE54278,200
3170 POKE54273,75:POKE54272,25
3180 FORZ=1TO50:NEXTZ
3190 POKE54273,50:POKE54272,200
3200 FORZ=1TO50:NEXTZ
3210 POKE54276,0
3220 NEXTK
3230 RETURN
3240 REM DIRECTIONS OF PLAY
3250 PRINT"■
3260 PRINTTAB(8)"
3270 PRINTTAB(8)"
3280 PRINTTAB(8)"
3290 PRINTTAB(8)"
3300 PRINTTAB(8)"
3310 PRINTTAB(8)"
3320 PRINTTAB(8)"
3330 PRINTTAB(7)"
3340 PRINTTAB(7)"
3350 PRINTTAB(7)"
3360 PRINT"
3370 PRINTTAB(30)"
3380 PRINT"
3390 FORZ=1TO1500:NEXTZ
3400 PRINT"□"TAB(11)"BY BILL RUSSELL"
3410 FORZ=1TO1500:NEXTZ
3420 PRINT"□"TAB(10)"DIRECTIONS (Y/N)?"
3430 GETQ$:IFQ$=""THEN3430
3440 IFQ$="N"THEN3760
3450 IFQ$<>"Y"THEN3430
3460 PRINT"□"TAB(15)"
3470 PRINT"
3480 PRINT"EXCEPT IF YOU RUN OUT OF CASH."
3490 PRINT"5P IS DEDUCTED FOR EACH TRY, & THE WIN"
3500 PRINT"LINES ARE DISPLAYED."
3510 PRINT"TO STOP WHEN ASKED TO PLAY 'P', PRESS"
3520 PRINT"THE 'S' KEY."
3530 PRINT"NUDGES AND HOLDS ARE SELF EXPLANATORY."
3540 PRINT"NB: IF YOU DON'T NUDGE THE REELS SPIN."
3550 PRINT"
3560 PRINT"
3570 GOSUB3720
3580 GOSUB2780
```

```
3590 PRINT"■WHEN A COIN DROPS IT GIVES THIS SOUND"
3600 GOSUB3720
3610 GOSUB2860
3620 PRINT"■WHEN YOU WIN IT GIVES THIS SOUND"
3630 GOSUB3720
3640 GOSUB2930
3650 POKE53280,14
3660 PRINT"■WHEN YOU LOSE IT GIVES THIS SOUND"
3670 GOSUB3720
3680 GOSUB3130
3690 PRINT"■ PRESS THE 'SPACE BAR' TO START PLAY"
3700 GOSUB3740
3710 GOTO3760
3720 REM PRESS SPACE ROUTINE
3730 PRINT"■ PRESS SPACE BAR TO CONTINUE PLEASE!"
3740 GET Q$:IFQ$<>" "THEN3740
3750 PRINT"□":RETURN
3760 REM LIMIT ON GAMES
3770 PRINT"□■■DO YOU TO LIMIT NUMBER OF TRIES"
3780 PRINT"TYPE 'N' OR AMOUNT."
3790 INPUT LM$
3800 IF LM$="N"THEN LM=9999:GOTO50
3810 LM=VAL(LM$)+1
3820 GOTO50
3830 POKE54296,0:END

READY.
```

HORSE RACE

The screen is the race track and the horses are represented by their number in reverse. There can be as many players as you wish, all of whom start with £100.00 and can bet on any one of the four horses in the race. The odds for each horse are displayed just before betting.

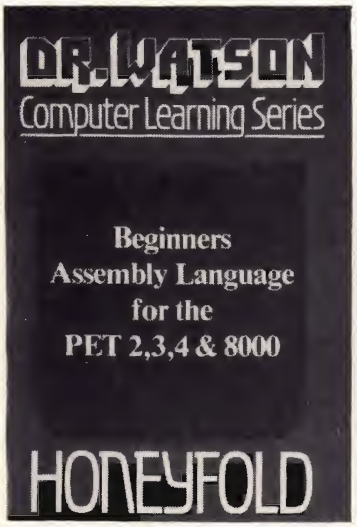
```
10 PRINT"□":CLR
20 REM SET ARRAYS
30 DIMHS(20),OD(20),BT(20)
40 REM SET DATA ARRAY
50 DIM DT(61,4)
60 GOTO1110
70 REM HORSE DATA ROUTINE
80 H(1)=1314:P(1)=177
90 H(2)=1242:P(2)=178
100 H(3)=1170:P(3)=179
110 H(4)=1258:P(4)=180
120 RETURN
130 REM DATA OF HORSE MOVEMENT
140 FOR I=1 TO 4
150 FOR K=1 TO 61
160 READ DT(K,I)
170 NEXTK,I
180 REM DATA HORSE (1)
190 DATA1,1,1,1,1,1,1,1,1,1
200 DATA1,1,1,1,1,1,1,1,1,1
210 DATA40,40,40,40,40,40,40,40,40
220 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
230 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
240 DATA-40,-40,-40,-40,-40
250 DATA-40,-40,-40,-40,1
260 REM DATA HORSE (2)
270 DATA1,1,1,1,1,1,1,1,1,1
```

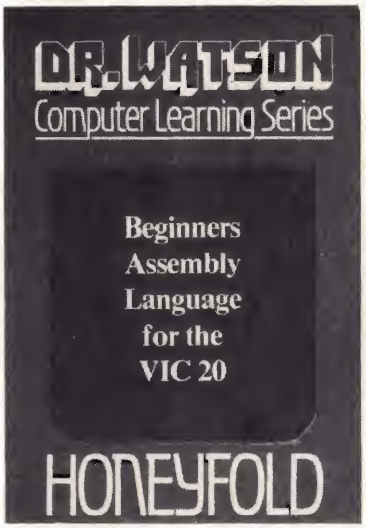
COMPLETE

BEGINNERS 6502/6510 COURSE

IN

ASSEMBLY LANGUAGE PROGRAMMING





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```
280 DATA1,1,41,41,41
290 DATA40,40,40,40,40,40,40
300 DATA39,39,39
310 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
320 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
330 DATA-41,-41,-41,-40,-40,-40,-40
340 DATA-40,-40,-40,-39,-39,-39,1
350 REM DATA HORSE (3)
360 DATA1,1,1,1,41,41,41,41,41
370 DATA40,40,40,40,40,40,40
380 DATA39,39,39,39,39
390 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
400 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
410 DATA-41,-41,-41,-41,-41,-40,-40,-40,-40
420 DATA-40,-40,-40,-39,-39,-39,-39,-39,1
430 REM DATA HORSE (4)
440 DATA41,41,41,40,40,40,40,40,40,40
450 DATA39,39,39,39,39,39,39
460 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
470 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1
480 DATA-41,-41,-41,-41,-41,-41,-41
490 DATA-40,-40,-40,-40,-40,-40,-40
500 DATA-39,-39,-39,-39,-39,-39,-39,1
510 RESTORE:RETURN
520 REM SET TRACK ROUTINE
530 POKE53280,5:POKE53281,5
540 PRINT"
550 PRINT"
560 PRINT"
570 PRINT"
580 PRINT"
590 PRINT"
600 PRINT"
610 PRINT"
620 PRINT"
630 PRINT"
640 PRINT"
650 PRINT"
660 PRINT"
670 PRINT"
680 PRINT"
690 PRINT"
700 PRINT"
710 PRINT"
720 PRINT"
730 PRINT"
740 PRINT"
750 PRINT"
760 PRINT"
770 PRINT"
780 REM PLACE HORSES
790 FORJ=1TO4
800 POKEH(J),P(J):POKEH(J)+54272,2
810 NEXTJ
820 REM START FLAG
830 PRINT"
840 PRINTTAB(15)"
850 PRINTTAB(15)"
860 PRINTTAB(15)"
870 PRINTTAB(15)"
880 FORZ=1TO1500:NEXTZ
890 PRINT"
900 PRINTTAB(15)"
910 PRINTTAB(15)"
920 PRINTTAB(15)"
930 PRINTTAB(15)"
940 C(1)=1:C(2)=1:C(3)=1:C(4)=1
950 FORI=1TO4:REM RACE ROUTINE
960 RN=INT(RND(0)*5)+1
970 FORK=1TORN
980 POKEH(I),32:POKEH(I)+54272,13
990 H(I)=H(I)+DT(C(I),I)
1000 POKEH(I),P(I):POKEH(I)+54272,2
1010 C(I)=C(I)+1
```

```
1020 IF C(I)>61 THEN1050
1030 NEXT X,I
1040 GOTO950
1050 PRINT"■■■■■■■■■■■■■■■■"
1060 WN=I
1070 PRINTTAB(12)"HORSE "WN" WINS!"
1080 FORZ=1TO1500:NEXTZ
1090 PRINT"□":POKE53280,14:POKE53281,6
1100 PRINT:GOTO1580
1110 REM START GAME ROUTINE
1120 PRINT"□"
1130 PRINTTAB(13)"■HORSE RACING■"
1140 PRINT"■"TAB(10)"BY BILL RUSSELL 1983"
1150 PRINT"■     ──────────────────────────────────"
1160 PRINT"■  YOU CAN BET ON HORSES 1-4."
1170 PRINT"  & EACH START WITH £100."
1180 REM HOW MANY PLAYERS AND RACES
1190 INPUT"■HOW MANY PLAYERS ";NO
1200 INPUT"■HOW MANY RACES   ";RC
1210 REM SET NAMES AND MONEY ROUTINE
1220 PRINT"■ ■YOU MUST TYPE NAMES OF PLAYERS■"
1230 DIMPL$(NO),PM(NO):FORJ=1TONO
1240 INPUT"■";PL$(J)
1250 PM(J)=100
1260 NEXTJ
1270 GOSUB130
1280 REM TAKE BETS
1290 FORRA=1TORC
1300 PRINT"□":GOSUB80
1310 PRINTTAB(10)"■ RACE NUMBER ■"RA
1320 GOTO1510
1330 FORPP=1TONO
1340 PRINT"■"PL$(PP)" WHAT HORSE"
1350 INPUTHS(PP)
1360 PRINT"■& HOW MANY £'S BET"
1370 INPUTBT(PP)
1380 BT(PP)=INT(BT(PP))
1390 IFBT(PP)<5THEN1470
1400 PM(PP)=PM(PP)-BT(PP)
1410 IF PM(PP)<0THEN1430
1420 GOTO1450
1430 PRINT"■ YOU'RE BROKE & THE MEETING IS OVER!"
1440 FORZ=1TO1000:NEXTZ:GOTO1740
1450 PRINT"■YOU HAVE"PM(PP)"£'S LEFT."
1460 GOTO1480
1470 PRINT"■ YOU STINGY SOD!":GOTO1400
1480 NEXT PP
1490 PRINT"■  OK! LETS START RACING !"
1500 FORZ=1TO1000:NEXT:GOTO520
1510 REM SET ODDS ROUTINE
1520 FORJ=1TO4
1530 RN=INT(RND(0)*10)+1
1540 OD(J)=RN
1550 PRINT"■ODDS OF HORSE "J" ARE "RN":1"
1560 NEXTJ
1570 GOTO1330
1580 REM PAY OUT ROUTINE
1590 FORPP=1TONO
1600 PRINT"■"PL$(PP)
1610 IFHS(PP)=WNTHEN1640
1620 PRINT"■ I'M AFRAID YOU LOST!"
```

The Lightening Oric Assembler. £9.90*

There are other assembler/editors available for the ORIC but none combine the same features and ease of use that we have obtained with this comprehensive utility program for the ORIC 48K. The manual which accompanies the assembler gives a brief insight into machine code and the use of assemblers to enable anyone to write in assembly language after just a little study. Full specifications of the assembler cannot be fitted into the small space available here and so they may be obtained from your local dealer or direct from Mr. Micro.

*Includes comprehensive instructions booklet.

Crazy Golf £6.90

48K Spectrum

Crazy golf is a new program for the 48K Spectrum you are required to clear the course avoiding and circumventing the many strange obstacles finally putting your ball in the hole. The par for each hole is displayed and a novel direction indicator combined with a force indicator enable you to send the golf ball in the direction you feel is the best one to clear the course. Crazy golf really is crazy but most of all it is fun and will be found to be very enjoyable by all members of the family.

For use with Joystick and keyboard.

Bengo £6.90

Vic 20

An exciting program for the unexpanded Vic 20, which combines fast moving strategy and reflex skills. You must control Bengo the super Eskimo against the dreadful snow Yeti – Half blind and half witted the Yeti can smell a good Eskimo lunch – the only protection Bengo has is to hurl huge blocks of ice across the frozen waste at the Yeti.

– Don't get distracted – or you'll be personally responsible for the demise of an Eskimo!

For use with Joystick.

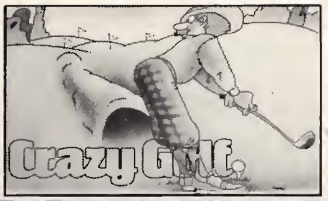
Dracula £6.90

48K ORIC

A superb adventure for the 48K ORIC. This adventure is written in the good old style! No silly graphics, no gratuitous drawings, no distractions from pure mental images of horrendous realism. This evocative text adventure of the old genre will have Oric owners shivering with anticipation and perhaps fear.

Dare you load DRACULA into your ORIC 48 ?!!

By keyboard.



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Mr. Micro means programs you can trust. Programs that are as exciting when you load them as they look at your dealer. Programs that come proven and refined. Programs that bring you the breathtaking excitement of arcade games with the special extra dimension of real mental challenges – all at the right price. Plus accessories and utilities which extend the value of your computer. Ask for Mr. Micro by name at your local dealer. Or order your games direct, post-free, from: Mr. Micro Ltd. 69 Partington Lane, Swinton, Manchester M27 3AL. Cheques should be made payable to Mr. Micro Limited. Ring our 24 hour hot-line for payment by Access or Visa on: 061-728 2282.

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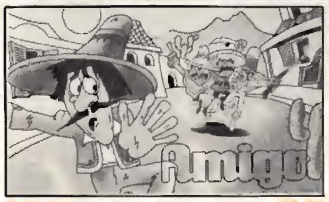
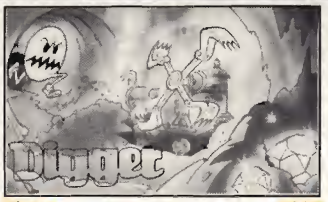


Amigo £6.90

Vic 20 8K or 16K expansion.

Hey Amigo you gotta run fast ah. The banditos they are a chasing you and they will a geta you ifa you do nota escapa OK. You musta runa rounda the blocka, when you run round de corners ofa de city the banditos they are frightened to go there and you score de points. Pity you have nota gota gun but a joystick can be fun.

For use with Joystick.



Digger £6.90

Vic 20 8K or 16K expansion

Your remote viewer shows the path of the professors devilish digging apparatus. Using your computer linked remote control you must guide the digger beneath the earth to collect the rare micronite gems. Unfortunately the micronite is protected by the micronits who will plague your machine in order to attempt to stop its progress. You may be able to kill the micronits by skillfully manoeuvering your digger beneath a subterranean stalactite which will then fall killing any micronit in its path. This is a novel implementation of a popular arcade game. For use with Joystick.

Humphrey £6.90

Vic 20 BBC Model B

This new game for the BBC Model B or for the VIC 20 (8K or 16K expansion) and also for C B M 64 involves some tricky decision taking.

Object of game is to make Humphrey land on all the cubes thus changing their colour. Unfortunately Humphrey is being chased by a bouncing ATOMIC BOMB! You will soon learn that this deceptively simple game has tremendous addictive properties and quite a high degree of tactical skill.

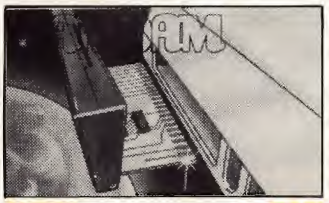
For use with keyboard or Joystick.

Mysterious Island £9.90

Vic 20 16K

Escape from prison in a hot air balloon – try to land it on Mysterious Island, then the fun really begins. ● Booby Trapped Fields ● Killer Bees ● Hostile Natives ● Hidden Clues ● Force Fields ● Capture the Nautilus ● Full Graphic Display ● Several Games lead to Exciting Climax ● Separate Practice Program ● Includes Blank Data Tape to store the game to play later.

All successful adventures can claim a unique personalised award by sending Mr. Micro their final position at the end of the game – By Joystick or keyboard.



RAMDAM £13.90

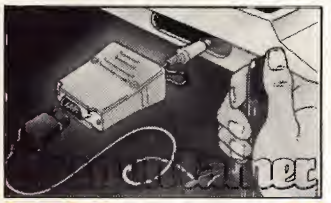
Vic 20

This accessory enables programs which would normally only work with 3K expansion to work with 8K or 16K expansion. RAMDAM saves having to buy a 3K pack if you already own an 8K or 16K. With RAMDAM and a Commodore 16K expansion all known tape games will run on your Vic 20. ● Includes Memory Test Program ● Free 6·5K game – MICROVADERS for use with Joysticks.

Punchy £6.90

Spectrum 48K

Punch has taken Judy for his evil purposes and locked her away. Judy has called upon the forces of goodness to escape, so with the help of our hero Bobby the policeman and you the purchaser of this fine program you must guide brave Bobby across the stage to rescue poor Judy. Leap the gaps. Jump over the dogs. Leap the alligator pit. Dodge the tomatoes. Rock the crib. Collect the sausages and finally rescue Judy. By Kempstone joystick or keyboard.



Dragon Tamer £9.90

Dragon 32

Allows Atari type and other digital joysticks to be used with the Dragon – giving better response and more control. For the first time your Dragon will be able to reflect your true skills. ● Achieve higher games scores ● Less Frustration.

Plus To ensure maximum value, Dragon Tamer includes two original games for use with digital Joysticks.

Goldrush £6.90

Vic 20 3·5k

This graphic adventure program was the first in the world to offer real gold for the successful adventurer. An idea which has been much copied but never equalled. ● Fun ● Educational ● Challenging ● Clues ● Puzzles ● Searches ● Fast Reaction Game. For use with keyboard.

```
1630 GOTO1700
1640 PRINT"■IT'S YOUR LUCKY DAY, YOU WON!"
1650 PRINT"■HORSE "WN" WON AT "OD(WN)":1"
1660 PRINT"■■ WITH A STAKE OF "BT(PP)" £'S"
1670 WM=(BT(PP)*OD(WN))+BT(PP)
1680 PRINT"■ MEANS YOU WIN "WM" £'S."
1690 PM(PP)=PM(PP)+WM
1700 FORZ=1TO500:NEXTZ,PP
1710 PRINT"■ ■ PRESS 'S' TO CONTINUE".
1720 GET Q$:IFQ$<>"S" THEN1720
1730 NEXTRA
1740 REM END ROUTINE
1750 FORZ=1TO1500:NEXTZ:PRINT"□"
1760 FORPP=1TONO
1770 PRINT"■"PL$(PP)" YOU FINISHED
                        WITH "PM(PP)" £'S"
1780 NEXT PP
1790 REM SORT FOR WINNER
1800 PP=1:WR=PP
1810 IF(PP=NO)THEN1850
1820 IFPM(PP)<PM(PP+1)THEN1840
1830 PP=PP+1:GOTO1810
1840 WR=PP+1:PP=PP+1:GOTO1810
1850 PRINT"■ ■THE WINNER WAS "PL$(WR)"■"
1860 REM CHECK FOR JOINT HIGH
1870 FORPP=1TONO
1880 IFWR=PPTHEN1910
1890 IFPM(PP)<>PM(WR)THEN1910
1900 PRINT"■ ■AND "PL$(PP)"■"
1910 NEXTPP
1920 PRINT"■    ■PLAY AGAIN ? (Y/N)■"
1930 GETQ$:IFQ$=""THEN1930
1940 IF Q$="Y"THENCLR:RUN
1950 IFQ$="N" THEN2160
1960 GOTO1930
1970 REM *** NOTES ***
1980 REM 'HORSE RACING' PROGRAM
1990 REM DESIGN BY BILL RUSSELL
2000 REM DATE 12TH FEB. 1983
2010 REM *** VARIABLES ***
2020 REM HORSE LOCATION - H
2030 REM HORSE POKE CODE - P
2040 REM HORSE DIRECTIONS - DT
2050 REM LOOPS - X,K,J,JJ,I
2060 REM NUMBER TO BET - NO
2070 REM NUMBER OF RACES - RC
2080 REM PLAYERS NAMES - PL$
2090 REM HORSE ODDS - OD
2100 REM HOW MUCH BET - BT
2110 REM HORSE BET ON - HS
2120 REM WINNING HORSE - WN
2130 REM MONEY WON - WM
2140 REM LOOPS - J,RA,PP
2150 REM PLAY AGAIN - Q$
2160 END

READY.
```

PETDO

This is a version of an arcade game of the same name. The object of this game is to move around the screen using the keyboard. You must move over the cherries to score points but at the same time avoiding the attackers which will kill you if they hit you. You can, if you fire at them while they are in the track left by yourself, kill them. Keyboard controls and instructions included in the program.

```
10 REM PETDO! BY GRAHAM JONES 17.8.83
20 PRINT"□                    ■■■■■■■■■■■■ PETDO! "
30 PRINT"■ BASED ON THE ARCADE GAME, PETDO!  USES THE KEYBOARD TO MOVE THE ";
40 PRINT"'♦' AROUND THE GAME AREA COLLECTING POINTS BY CLEARING CHERRIES '♣'";
50 PRINT" & KILLING ATTACKERS '●'     THEY ARE ONLY VUNERABLE WITHIN THE ";
60 PRINT"TRAILLEFT BEHIND THE PETDO!. KILL AN ATTACKER BY USING KEY '5'";
70 PRINT"THIS FIRES A LAZER IN  THE DIRECTION OF TRAVEL WITHIN THE TRAIL "
80 PRINTTAB(19)"8■■ ■■■■■■4 - 5 - 6■■■■■■■ ■■■■■■■2"
90 PRINT"■■PRESS ANY KEY TO START"
100 GETA$:IFA$=""THEN100
110 FORI=826TO850:READA:POKEI,A:NEXT
120 S1=33626:S2=S1:S3=S1:S4=S1:TS=0:PS=0:PL=4
130 PRINT"□":A1=33067:SYS826:X=RND(-TI):D1=0:D2=0:D3=0:D4=0:D=0:FS=0
140 M1=209:M2=M1:M3=M1:M4=M1:N1=160:N2=N1:N3=N1:N4=N1
150 PRINT"□ MEN      TOP SCORE          SCORE          ":SK=0
160 PRINTTAB(5)"□";:FORI=1TOPL:PRINT"□♦";:NEXT:PRINT"■■ ";
170 PRINTTAB(18)"□"HH;TAB(32)TS+PS
180 FORI=1TO22:PRINT"■♣■■■■■■■■■■■■
```

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```
220 POKETP,216:NEXT:POKEA1,90
230 PRINT"■"TAB(32)PS+TS:IFFS>4000THENTS=TS+PS:PS=0:GOTO130
240 K=PEEK(151):GOTO440
250 IFK=18THEND=40:LA=66:GOTO300
260 IFK=42THEND=-1:LA=70:GOTO300
270 IFK=41THEND=1:LA=70:GOTO300
280 IFK=50THEND=-40:LA=66:GOTO300
290 IFK=34THENGOSUB350
300 B1=A1:A1=A1+D:IFPEEK(A1)=170THENA1=B1:GOTO230
310 IFPEEK(A1)=160THENFS=FS+1:PS=PS+1
320 IFPEEK(A1)=216THENFS=FS+100:PS=PS+100
330 IFPEEK(A1)=209ORPEEK(A1)=81THEN710
340 POKEB1,32:POKEA1,90:GOTO230
350 X1=A1+D:IFPEEK(X1)=170THENX1=A1:GOTO230
360 FORLF=1TO7:IFPEEK(X1)=32THENPOKEX1,LA:X1=X1+D:NEXT
370 IFPEEK(X1)=M1THEND1=1:GOTO420
380 IFPEEK(X1)=M2THEND2=1:GOTO420
390 IFPEEK(X1)=M3THEND3=1:GOTO420
400 IFPEEK(X1)=M4THEND4=1:GOTO420
410 X1=A1+D:FORLD=1TOLF-1:POKEX1,32:X1=X1+D:NEXT:RETURN
420 SK=SK+1:IFSK=4THENSK=0:PS=PS+1000:FS=FS+1000:GOTO130
430 POKEX1,42:X1=A1+D:FORI=1TOLF:POKEX1,32:X1=X1+D:NEXT:PS=PS+500:RETURN
440 SD=INT(4*RND(1)+1):MS=INT(5*RND(1)+1)
450 IFSD=1THENGS=-40:GOTO490
460 IFSD=2THENGS=1:GOTO490
470 IFSD=3THENGS=40:GOTO490
480 GS=-1
490 Z=INT(4*RND(1)+1)
500 ONZGOTO510,560,610,660
510 IFD1=1THEN250
520 FORM=1TOMS:POKES1,N1:S1=S1+GS:IFPEEK(S1)=170THENS1=S1-GS:POKES1,M1:GOTO250
530 IFPEEK(S1)=90THENGOTO710
540 N1=160:M1=209:IFPEEK(S1)=32THENN1=32:M1=81
550 POKES1,M1:FORV=1TO5:NEXTV,M:GOTO250
560 IFD2=1THEN250
570 FORM=1TOMS:POKES2,N2:S2=S2+GS:IFPEEK(S2)=170THENS2=S2-GS:POKES2,M2:GOTO250
580 IFPEEK(S2)=90THENGOTO710
590 N2=160:M2=209:IFPEEK(S2)=32THENN2=32:M2=81
600 POKES2,M2:FORV=1TO5:NEXTV,M:GOTO250
610 IFD3=1THEN250
620 FORM=1TOMS:POKES3,N3:S3=S3+GS:IFPEEK(S3)=170THENS3=S3-GS:POKES3,M3:GOTO250
630 IFPEEK(S3)=90THENGOTO710
640 N3=160:M3=209:IFPEEK(S3)=32THENN3=32:M3=81
650 POKES3,M3:FORV=1TO5:NEXTV,M:GOTO250
660 IFD4=1THEN250
670 FORM=1TOMS:POKES4,N4:S4=S4+GS:IFPEEK(S4)=170THENS4=S4-GS:POKES4,M4:GOTO250
680 IFPEEK(S4)=90THENGOTO710
690 N4=160:M4=209:IFPEEK(S4)=32THENN4=32:M4=81
700 POKES4,M4:FORV=1TO5:NEXTV,M:GOTO250
710 PL=PL-1:GOSUB800:IFPL>0THEN130
720 PRINT"■   YOU HAVE SCORED"PS+TS:IFHH=>TS+PSTHEN740
730 PRINT"■■   YOU BEAT THE HIGHEST SCORE TODAY":HH=TS+PS:GOTO750
740 PRINTTAB(6)"■HIGHEST SCORE TODAY "HH
750 PRINT"■■■DO YOU WANT TO PLAY AGAIN Y/N"
760 GETA$:IFA$=""THEN760
770 IFA$="Y"THEN120
780 IFA$<>"N"THEN760
790 END
800 FORI=1TO4:POKEA1-D,I+34:FORJ=1TO150:NEXTJ,I:POKEA1,32:RETURN
810 DATA169,128,133,95,169,0,133,94,162,4,160,0,169,160
820 DATA145,94,200,208,249,230,95,202,208,244,96
READY.
```

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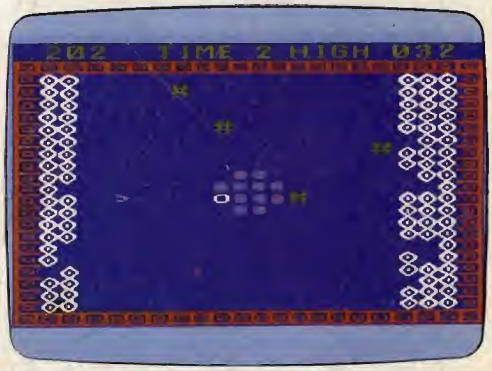

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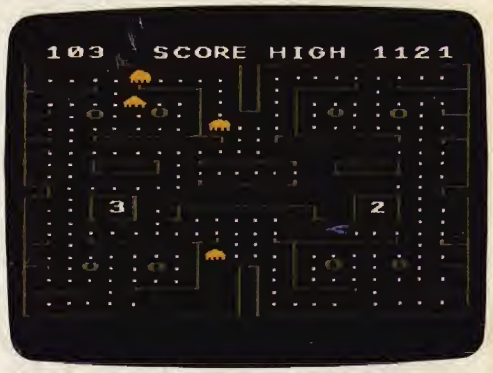

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